



HAEMATOLOGY AND SERUM BIOCHEMICAL CHARACTERISTICS OF BROILER FINISHERS FED DIETS CONTAINING CASSAVA PEEL MEAL (CPM).

S. U. Ilo¹, A. I. Onwusika², N. W. Nnaji¹, C. Ezenwosu¹

¹Department of Animal Science, University of Nigeria Nsukka. Enugu State, ²Department of Agricultural Technology, Federal Polytechnic Oko. Anambra State

Corresponding author: S. U. Ilo; E-mail: stanley.ilo@unn.edu.ng; Tel: 07036885828

Abstract

A 56-day study was carried out to evaluate the haematological and biochemical characteristics of broiler finisher fed cassava peel meal (CPM). Ninety six (96) day old chicks were used for the experiment. The birds were randomly divided into four (4) treatment groups with three replicates containing 8 birds each in a completely Randomized Design (CRD). The experimental diets were formulated to contain 0% cassava peel meal (T₁) control, 5% (T₂), 10% (T₃) and 15% (T₄) respectively. Feed and water were served *ad-libitum* throughout the experimental period. Data were collected for haematological and biochemical parameters. Haematological parameters include RBC, WBC, PCV, Hb, MCHC, MCH and MCV, while serum biochemical parameters include urea, total protein, albumin, globulin, creatinine, cholesterol, and glucose. Result of the biochemical parameters showed that urea values on the control (18.94mg/dl) was significantly higher ($P<0.05$) than on the diet with 10% CPM (7.73mg/dl) only. Cholesterol values on the 5%CPM was significantly lower ($P<0.05$) than values on diet with 10%CPM (161.92) and that with 15%CPM (180.13 mg/dl). However, birds on the 15%CPM had significantly higher cholesterol values than on the other diets and on the control. Birds on 10%CPM had significantly lower albumin values (10.40g/l) than those on the control (13.38), 5% CPM (13.50) and 15%CPM (17.37g/l). Values for creatinine, glucose, globulin and total protein did not vary significantly ($P>0.05$) across the diets. None of the haematological parameters measured differed significantly across the diets indicating that the birds were healthy. However, the inclusion of processed CPM at 10% of the diet is recommended to minimize cholesterol intake by man.

Keywords: Haematology, Blood Chemistry, CPM and Broiler Finisher

Introduction

Profitability in the rearing of poultry birds like any other livestock in Nigeria as in other developing countries is influenced by a combination of various inputs which are required to maintain faster growth rate as well as reduce feeding cost which constitutes the highest operational cost. High production cost resulting from feed is a major factor affecting the development of livestock industries in developing countries (Kawe *et al.*, 2007). There is also a pressing need to explore the use of unconventional and local feedstuff, which is underexploited by poultry farmers in order to reduce feed costs. There is increased interest by Nigerian livestock farmers and researchers to harness unconventional feed ingredients. Cassava peels like most agricultural wastes is made up of mainly polysaccharides which are widespread in nature. They account for an estimated 66% of all global bound carbon (Gardnea, 1974). Cassava peel contains 27.9% dry matter, 5.3% crude protein and 1.2% ether extract. It is relatively high in crude fibre 20.97% and ash 5.93%. It contains 66.6% Nitrogen free extract (Omole and Sonaiya, 2000). The utilization will at the same time reduce the environmental pollution caused by this waste product. The great limitation in the utilization of cassava peel as substitute for maize is its high hydrocyanic acid (HCN) content which is toxic to monogastrics. The use of blood examination as a way of assessing the health status of animals has been documented (Muhammad *et al.*, 2000). The importance of hematological and biochemical parameters as diagnostic tools and physiological indicators in birds has been documented (Harr, 2002; Hauptmanova *et al.*, 2006). However, these parameters are greatly affected by sex, age and season (Fudge, 2000; Kecici and Col, 2011). The objective of this study is to evaluate the haematological and biochemical characteristics of broiler finisher fed diets containing cassava peel meal (CPM).



Materials and Methods

Study location: The research was carried out at the poultry project site of the Federal College of Agriculture, Ishiagu, Ebonyi State.

Source and processing of cassava peel: Cassava peel that was used as feed ingredient was procured from the College cassava milling unit. They were processed (sundried) and milled in a hammer mill with 2mm sieve to produce cassava peel meal (CPM) that was used to compound the diet.

Diet: The experimental diets were formulated to contain 0% cassava peel meal treatment 1 (T₁) that is the control, 5% (T₂), 10% (T₃) and 15% (T₄) respectively.

Experimental procedure: Ninety six (96) day old chicks were used for the experiment. The birds were randomly divided into four (4) treatment groups in a completely randomized design (CRD) with three replicates containing 8 birds each.

Blood Collection for Hematological and Biochemical Analysis

At the end of the feeding trial, about 5mls of blood sample was collected for the analysis. The blood samples were taken from the wing vein of the bird using disposable needle and syringe. For haematological analysis, about 2mls used for analysis was stored in a bottle containing anticoagulant, ethylene diamine tetra acetic acid (EDTA) to prevent clotting and subsequently analyzed to determine RBC, WBC, PCV, Hb MCHC, MCH and MCV. While for serum biochemistry analysis, about 3mls was used. It was store without anticoagulant, after coagulation, the serum separated was used to determine the following parameters urea, total protein, albumin, globulin, creatinine, cholesterol, and glucose.

Data Collection and Analysis

Data collected for haematological and biochemical parameters were analyzed using analysis of variance (ANOVA) appropriate for (CRD) and treatment means were separated using Duncan's multiple range test (Duncan, 1955)

Table 1: Composition of Experimental Diets

Ingredients	Treatments			
	T ₁ (0%)	T ₂ (5%)	T ₃ (10%)	T ₄ (15%)
Maize	50.00	45.00	40.00	35.00
Cassava Peel Meal	-	5.00	10.00	15.00
Soya bean	25.00	25.00	25.00	25.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	18.00	18.00	18.00	18.00
Blood meal	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100

Table 2: Serum Biochemical Indices of Broiler Finisher Fed Diets Containing Cassava Peel Meal

Parameters	Treatments				SEM
	T ₁ (0%)	T ₂ (5%)	T ₃ (10%)	T ₄ (15%)	
Urea (mg/dl)	18.94 ^a	12.15 ^{ab}	7.73 ^c	11.07 ^{ab}	1.46
Creatinine (mg/dl)	0.68	0.83	0.67	0.68	0.09
Cholesterol (mg/dl)	151.92 ^b	149.48 ^c	161.92 ^b	180.13 ^a	0.27
Glucose (mg/dl)	180.72	194.46	157.08	171.17	18.04
Albumin (g/l)	13.35 ^b	13.50 ^b	10.40 ^c	17.37 ^a	0.94
Globulin (g/l)	14.95	14.53	17.53	16.73	1.62
Total Protein (g/l)	28.30	28.00	33.95	33.83	2.06

a,b,ab,c Means within a row with different superscripts differ significantly (p<0.05).



Results and Discussion

Table 2 above showed the biochemical parameters of broiler finisher fed cassava peel meal (CPM). Urea values on the control were significantly higher than values on 10% CPM only. The urea values, (7.73-18.94 mg/dl) differed from that (19.82-54.80 mg/dl) of Adeyemo and Sani (2013) for broilers fed hydrolysed cassava peels as replacement for maize. Cholesterol value on 15% level differs significantly higher ($P<0.05$) than 5% levels, while 10% and 0% (control) levels are similar. The range (149.48-154.49 mg/dl) observed in the present study differed from that (81.46-154.49 mg/dl) for cholesterol. More so, albumin value on 15% level differs significantly higher ($P<0.05$) than 10% level, while that of 0% and 5% are similar. Range obtained for albumin (10.40-17.37 g/l) is at variance with that of Egbunike *et al* (2009) that reported (1.42-3.40 mg/dl). The differences observed could be due to the quality of feed materials and also the level of anti-nutritional factors present in the CPM as has been observed by Akinmutimi (2004). Almeida (2006) reported that at age 21, broilers had low cholesterol levels due to demand for energy caused by higher body development. Biochemical parameters generally can be used to monitor protein quality of feeds. They are important in the proper maintenance of the osmotic pressure between the circulating fluid and the fluid in the tissue spaces so that exchange of materials between the blood and cells could be facilitated. They also contribute to the viscosity and maintenance of normal blood pressure and pH (Ladokun *et al.*, 2008).

Table 3: Haematological Characteristics of Broiler Finisher Fed Diets Containing Cassava Peel Meal

Parameters	T ₁ (0%)	T ₂ (5%)	T ₃ (10%)	T ₄ (15%)	SEM
RBC ($\times 10^{12}/l$)	3.73	3.94	3.82	4.02	0.18
WBC ($\times 10^9/l$)	8.77	6.93	7.60	8.80	0.16
PCV (%)	28.67	30.33	29.67	30.33	0.81
Hb (g/dl)	9.70	10.37	10.10	10.27	0.26
MCV (fl)	76.80	77.31	77.79	76.98	2.19
MCH (g/dl)	25.99	26.42	26.46	26.03	0.72
MCHC (%)	33.84	34.18	34.03	33.97	0.16

RBC=Red blood cell; WBC=White blood cell; PCV=Packed cell volume, Hb= Hemoglobin; MCHC=Mean corpuscular hemoglobin concentration; MCH=Mean corpuscular haemoglobin; MCV=Mean corpuscular volume.

Table 3 above showed the haematological characteristics of broiler finisher fed cassava peel meal (CPM). The result revealed that all the parameters showed that there were no significant differences across the diets. Hb values obtained ranged from 9.70-10.37 g/dl. T₂ had the highest value of 10.37 g/dl, followed by T₄ 10.27 g/dl while T₁ had the least value of 9.70 g/dl. The Hb values obtained in this study were within the normal range of (7.0-13.0g/dl) reported for birds (Jain, 1993). Haemoglobin concentration of blood has been associated with availability of nutrients to the animal body (Esonu *et al.*, 2001). PCV values obtained were all within the normal range of 22-35 % reported by (Jain 1993). They were however lower than the values of 25 to 45% reported by Mirtuka and Rawnsley (1997). Broilers in T₃ recorded the highest values in MCV (77.79 fl), followed by birds in T₂ (77.31 fl), while T₁ had the least (76.80 fl). The MCV values obtained was below the normal range of (90 to 140 fl) reported by Mirtuka and Rawnsley (1997). Mean corpuscular volume is an indication of the average volume of blood cells (Lazzaro, 2003). WBC result ranged from 6.93-8.80 $\times 10^9/l$. T₃ gave the highest value, followed by T₁ and the least was in T₂. The result disagreed with the findings of Adeyemo and Sani (2013) that showed significant ($p<0.05$) differences in the WBC of broilers fed CPM.

Conclusion

The study indicated that processed cassava peel meal could effectively be added to diets of finisher broilers at 10% of the diets to improve the performance of the animals. Moreover, there was no threat to the health of the birds as all haematological and some of the biochemical values were within the normal range for healthy birds.



References

- Adeyemo, I.A. and Sani, A. (2013). Haematological parameters and serum biochemical indices of broiler chickens fed (*Aspergillus niger*) hydrolyzed cassava peel meal based diet. *IJRRAS*, 15 (3): 24.
- Akinmutimi, A. H. (2004). Evaluation of sword beans (*Canavalia gladiata*) as alternative feed source for broiler chicken. Ph.D Thesis, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.
- Almeida, J. G., Vieira, S. I., Gallo, B. B., Conde, O. R. A. and Olmos, A. R. (2006). Period of incubation and post-hatching holding time influence on broiler performance. *Brazilian Journal of Poultry Science* 8:153- 158.
- Cetin, N., Bekyurek, T and Cetin, E. (2009). Effect of sex, pregnancy and season on some haematological and biochemical blood values in Angora rabbits. *Scand. J. Lab. Anim. Sci.* 36 (2): 155-162.
- Duncan, B. (1955). Multiple Range and Multiple F-test Biometrics. 11:1:41 Readdy N.R. Mic press, New York. Pp. 143-153.
- Egbunike, G.N., Agiang, E.A., Owosibo, A.O. and Fatufe, A.A. (2009). Effect of protein on performance and haematology of broilers fed cassava peel-based diets. *Arch. Zootec.* 58 (224): 655-662.
- Esonu, B.O., Emelalom, O.O., Udedibie, A.B.I., Herbert, U., Ekpok, C.F., Okoli, I.C. and Iheukwumere, F.C. (2001). Performance and blood chemistry of weaner pigs fed raw mucuna bean (Velvet bean) meal. *Trop. Anim. Prod. Invest.* 4: 49-54.
- Fudge, A.M., (2000). Laboratory Medicine: Avian and Exotic Pets. W.B. Saunders Company, Philadelphia.
- Gardnea, K.H., and Blackwell, J. (1974). In: Microbiological Enzymes and Bioconversion, Economic Microbiology. Vol. 5 (ed. A.H.Rose) Academic Press, London. pp 283-327.
- Harr, K.E. (2002). Clinical chemistry of companion avian species: A review. *Vet. Clin. Pathol.*, 31: 140-151.
- Hauptmanova, K., Maly, M. and Literak, I. (2006). Changes of haematological parameters in common pheasant throughout the year. *Vet. Med.*, 51: 29-34.
- Jain, N.C. (1993). Essential of Veterinary Haematology, Lea and Ferbiger, Philadelphia.
- Kawe, S. M., Faruk, I. U. and Richard, A. S. (2007). Growth Response and carcass characteristics of rabbits fed graded levels of *Leucaena leucocephala* diets. In: Proc 32nd Ann. Conf. of the Nig. Soc. for Anim. Prod. March, University of Calabar, Nigeria. pp. 425-454.
- Kececi, T. and Col, R. (2011). Haematological and biochemical values of the blood of pheasants (*Phasianus colchicus*) of different ages. *Turk. J. Vet. Anim. Sci.*, 35: 149-156.
- Ladokun, A.O., Yakubu, A., Otite, J.R., Omeje, J.N., Sokunbi, O.A. and Onyeji, E. (2008). Haematological and serum biochemical indices of naked neck and normally feathered Nigerian indigenous chickens in a sub humid tropical environment. *International Journal of Poultry Science*, 7 (1): 55-58.
- Lazzaro, J. (2003). Normal Blood Chemistry for Goats, Sannendoah Dairy Goats. <http://www.saanendoah.com/bloodvalues.html//measure>
- Mirtuka, B. M. and Rawnsley, H. M. (1997). Clinical, Biochemical and Haematological Reference Value in Normal Experimental Animals. Mason Publishing Company, New York. P 35-50.
- Muhammad, N.O., Adeyina, A.O and Peters, O.M. (2000). Nutritional evaluation of fungi treated cocoa bean shell. *Nigerian J. Pure and Appl. Sci.*, 5: 1059-1064.
- Omole, T.A and Sonaiya, E.B. (2000). The effect of protein source and methionine supplementation of cassava peels utilization by growing rabbits. *Nutr. Rep. Int.* 23 (4): 729-737.