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Haematological and serum biochemical indices of growing rabbits fed camel blood-rumen content mixture

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Abstract

Forty-five crossbred rabbits (Dutch × New Zealand White) of mixed sexes with age between 5 and 7 weeks were divided into 5 groups of 9 rabbits and fed camel blood–rumen content mixture (CBRCM) for 10 weeks. The CBRCM which contained 36.40% crude protein and 22.36% crude fibre was included at 0, 10, 20, 30 and 40% levels in diets of group 1, 2, 3, 4 and 5 respectively. The packed cell volume (PCV), red blood cells (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were not significantly different ($P>0.05$) among the treatments groups, although the haemoglobin (Hb) and white blood cells (WBC) were significantly ($P<0.05$) influenced by the treatments. The number of basophils, neutrophils, eosinophils and lymphocytes were not affected by the levels of inclusion, however, only the monocytes differed significantly ($P<0.05$) among the treatments. All values for blood parameters were within the normal range for growing rabbit. Thus, the study indicated that up to 40% CBRCM could be incorporated into the diets of growing rabbits without compromising the health status of the rabbits.

Key words: Camel Blood-Rumen Content Mixture, Rabbits, Blood Parameters

Introduction

Blood-rumen content meal is an abattoir waste that is often environmentally unfriendly. It has been reported to have potentials as source of protein and fibre in rabbit's diet (Dairo et al., 2005; Mohammed et al., 2005, Adeniji, 2008).

The protein content has been reported to vary based on the nutrition and species of the ruminant from which the rumen content are obtained. It is also known that various species of ruminants harbour different types of micro-organisms that will obviously influence the quality of protein of the rumen content (Mann, 1984; Whyte and Wadak, 2002; Mohammed et al., 2008).

Haematological and biochemical blood components are influenced by the quantity and quality of feed (Akinmutimi, 2004). Biochemical and haematological components of blood are sensitive to elements of toxicity in feed, especially with feed constituents that affect the formation of blood (Oyawoye and Ogunkunle, 1998). This study was therefore undertaken to assess the effect of feeding the camel blood-rumen content mixture on haematological and biochemical parameters of growing rabbits.

Materials and Methods

This study was carried out at the Rabbit Unit of the Teaching and Research Farm, University of Maiduguri. Forty-five (45) crossbred rabbits (Dutch × New Zealand White) of mixed sexes with age ranging from 5 to 7 weeks were randomly allocated to five treatments in groups of 9 rabbits each. Each rabbit was housed individually in a cage cell and supplied daily with the experimental diets in mash form. Clean drinking water was also provided *ad libitum* throughout the experimental period.

The composition of the experimental diets is shown in Table 1. The diets contained 0, 10, 20, 30 and 40% CBRCM in diets 1 (control), 2, 3, 4 and 5 respectively.

At week 10 of the experiment, blood samples were collected randomly from three (3) rabbits per treatment for the determination of the haematological and serum biochemical indices. Samples were collected from the ear vein of the rabbits by venipunture using disposable needle (21–gauge needle) and syringes. The rabbits were fasted overnight (12hrs) and normally bled in the morning (7.00–8.00am) to avoid excessive bleeding. The collection site was cleaned with alcohol and xylene to dilate the veins. Sterile cotton was used to cover the

Table 1: Composition of the experimental diets

	Diets / Treatments				
Ingredient (%)	1	2	3	4	5
Maize	40.98	39.12	37.41	35.24	24.35
Wheat offal	17.00	17.00	17.00	17.00	17.00
CBRCM	0.00	10.00	20.00	30.00	40.00
Groundnut cake	23.37	15.23	6.94	2.11	0.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Groundnut haulms	13.00	13.00	13.00	13.00	13.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Common salt (NaCl)	0.50	0.50	0.50	0.50	0.50
Premix*	0.15	0.15	0.15	0.15	0.15
Total	100.00	100.00	100.00	100.00	100.00
Determine Analysis (%)					
Crude protein (CP)	19.20	19.01	18.94	18.63	18.24
Crude fibre (CF)	18.34	19.34	20.12	20.37	22.36
Ether extract (EE)	4.50	3.50	3.40	3.82	3.66
Total Ash	2.00	3.01	3.08	3.07	3.50
Nitrogen-free extract (NFE)	55.96	55.14	54.46	54.17	54.13
ME (Kcal/kg)	3061.48	2953.10	2909.51	2861.02	2892.96

CBRCM = Camel blood-rumen content mixture

* Premix (grow fast) manufacture by Animal care service consult (Nig) Ltd. Lagos, Supplying the following per kg of premix: Vitamin A, 5000,00 IU; Vitamin D_3 800,000IU; Vitamin E, 12,000mg; Vitamin K, 1,5000mg; Vitamin B_1, 1,000mg; Vitamin B_2, 2,000mg, Vitamin B_6, 1,500mg; Niacin, 12,000mg; pantothenic acid, 20.00mg; Biotin, 10.00mg; Vitamin B_{12}, 300.00mg; folic acid, 150,000mg; choline, 60,000mg; manganese, 10,000mg; iron, 15,000mg, zinc 800.00mg; Copper 400.00mg; Iodine 80.00mg; cobalt 40mg; selenium 8,00mg.

punctured vein after collection. The blood samples were collected in sample bottles containing dipotassium salt of ethylene diamine–tetra acetic acid (EDTA–K^{2+}) which served as a anticoagulant for haematology while the bottles for serum biochemical indices were free of EDTA–K^{2+}.

The haematological analysis of blood samples were carried out at the Department of Veterinary Public Health, Faculty of Veterinary Medicine, University of Maiduguri, Nigeria, using the routinely available clinical methods (Bush, 1975). The haematological indices determined were packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) count and white blood cell (WBC) count and differential count. Mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were obtained from calculation according to standard formulae (Schalm et al., 1975; Jain, 1986).

The other blood samples collected without coagulant were used to determine the biochemical components such as albumin, total protein, cholesterol, globulin, glucose, calcium and phosphorus using the methods described by other workers (Spencer and Price, 1997; Ajagbonna et al., 1999; Uko et al., 2000).

Statistical Analysis

All the data collected were subjected to analysis of variance (ANOVA) using a randomized complete block design (Steel and Torrie, 1980). Means were compared, where applicable, using the Duncan's multiple range test (Duncan, 1955).

Results and Discussion

The result for the haematological and serum biochemical indices is shown in Table 2. The inclusion levels of CBRCM did not affect PCV, RBC, MCV, MCH and MCHC values. The values obtained in this study were similar to those reported by other workers (Dairo, 2005; Mohammed et al., 2005) who fed similar diets to growing rabbits. The values for HB and WBC differed significantly ($P<0.05$) among the treatment groups. However, the values were comparable to the values reported by Anon (1980) for normal healthy growing rabbits. The normal range of values observed for all the treatments suggest adequate protein in the experimental diets for normal metabolic and physiological activities. The basophils, neutrophils, eosinophils and lymphocytes were not significantly ($P< 0.05$) affected by treatments, only monocytes were significantly influenced ($P<0.05$) by the diets. Rabbits on treatment 2 (10%) had higher concentration of monocytes than other treatments, the values obtained for all the groups were within normal range as reported by Anon (1980). In differential count, an abnormally higher monocytes level is synonymous with bacterial infection (Akinmutimi, 2004).

Table 2: Haematological indices in rabbits fed diets containing various levels of camel blood-rumen content mixture

Parameter	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)	SEM
PCV (%)	42.67	43.00	47.00	44.00	45.0	1.41^{NS}
Hb (g/100ml)	10.33^{b}	11.00^{ab}	12.33^{a}	11.33^{ab}	11.33^{ab}	0.51^{*}
RBC ($x10^6/mm^3$)	4.58	4.08	4.03	3.34	4.36	0.58^{NS}
WBC ($x10^3/mm^3$)	3.28^{a}	3.62^{a}	1.83^{b}	3.30^{a}	2.85^{a}	0.26^{*}
MCV (Fl)	103.03	105.49	119.57	116.60	104.23	13.85^{NS}
MCH (Pg)	24.53	27.74	31.08	30.08	26.10	2.9^{NS}
MCHC (%)	24.17	25.64	26.28	25.76	25.18	0.80^{NS}
Differential count						
Monocytes %	2.00^{a}	4.33^{a}	2.67^{ab}	2.67^{ab}	2.67^{ab}	0.67^{*}
Basophils %	1.00	1.33	0.67	0.67	1.00	0.54^{NS}
Neutrophis %	40.67	38.33	41.00	31.33	42.33	4.96^{NS}
Eosinophils %	8.33	11.00	8.00	6.00	9.67	1.14^{NS}
Lymphocytes %	45.00	44.00	47.08	58.00	44.33	5.81^{NS}

[a,b]Means in the same row bearing different superscripts differ significantly (P<0.005)
NS =Not significant (P>0.05); RBC = Red blood cell counts; *= Significant (P<0.05); WBC = White blood cell counts; CBRCM = Camel blood-rumen content mixture; MCV = Mean corpuscular volume; PCV = Packed cell volume; MCH = Mean corpuscular haemoglobin concentration; Hb = Haemoglobin; MCH = Mean corpuscular haemoglobin

Table 3: Serum biochemical indices in rabbits fed diets containing various levels of camel blood-rumen content mixture

Parameter	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)	SEM
Albumin (g/dl)	4.23^{a}	4.14^{ab}	3.38^{b}	4.10^{ab}	3.97^{ab}	0.25*
Total protein (g/dl)	5.64	6.01	5.77	5.82	6.30	0.21^{NS}
Cholesterol (mg/dl)	39.11^{a}	38.04^{ab}	41.02^{a}	35.61^{b}	40.04^{a}	1.00^{*}
Globulin (g/dl)	2.66	2.73	2.95	2.77	2.70	0.36^{NS}
Glucose (mg/dl)	81.87^{ab}	82.03^{ab}	80.34^{b}	87.44^{a}	72.04^{c}	2.09^{*}
Calcium (mg/dl)	6.73	6.90	6.20	6.50	6.17	0.71^{NS}
Phosphorus (mg/dl)	2.61	2.54	2.07	2.57	2.06	0.18^{NS}

[a,b]Means in the same row bearing different superscripts differ significantly (P< 0.005)
NS =Not significant (P>0.05); *****= Significant (P<0.05); SEM = Standard error of means

to the values reported by Anon (1980) for normal healthy growing rabbits. The normal range of values observed for all the treatments suggest adequate protein in the experimental diets for normal metabolic and physiological activities. The basophils, neutrophils, eosinophils and lymphocytes were not significantly (P< 0.05) affected by treatments, only monocytes were significantly influenced (P<0.05) by the diets. Rabbits on treatment 2 (10%) had higher concentration of monocytes than other treatments, the values obtained for all the groups were within normal range as reported by Anon (1980). In differential count, an abnormally higher monocytes level is synonymous with bacterial infection (Akinmutimi, 2004).

Serum biochemical values such as total protein, globulin, calcium and phosphorus were not significantly different (P>0.05) among rabbits on different dietary treatments. The study indicates that there was no wasting or catabolism of muscle tissues and that rabbits were not surviving at the expense of body reserve. This was a good sign that dietary protein was well utilized by the rabbits. The albumin differed significantly (P<0.05) among groups. Rabbits on control diets had higher albumin value than other treatments. Cholesterol and glucose values were also significant different (P<0.05) among the treatments. However, the values were within the normal range as reported elsewhere (Anonymous, 2006).

The haematological and biochemical values obtained for rabbits fed camel blood-rumen content meal fell within normal stipulated ranges. This is a good indication that camel blood-rumen content can be fed to growing rabbits without any health hazard. However, there is still the need for further studies on histopthatology which was not covered in this study.

References

Adeniji, A.A. 2008. Replacement value of maize with enzyme supplemented decomposed bovine rumen content in the diet of weaner rabbits. *Journal of Animal and Veterinary Advances*, 3:104-108.

Ajagbonna, O.P., Onifade, K.I. and Suleman, U. 1999. Haematological and biochemical changes in rats given extracts of *Calotropis procera*. Sokoto *Journal of Veterinary Sciences*, 1: 36 – 42.

Akinmutimi, A. H. 2004. Evaluation of sword bean (*Canavalia gladiate*) as an alternative feed resource for broiler chickens. Ph.D Thesis, Michael Okpara University of Agriculture, Umudike, Nigeria.

Anon, 1980. Guide to the Care and Use of Experimental Animal Vol. 1. Canadian Council on Animal Care, Ottawa, Ontario, Canada. Pp: 85–90.

Bush, B.M. 1975. Veterinary Laboratory Manual. William Heinemann Medical Books Ltd London. P: 447.

Dairo, F.A.S. 2005. Assessment of rumen content on the haematological parameters of growing rabbits: Proc. of 10th Annual Conference of Animal Science Association of Nigeria (ASAN), Sept. 12-15. University of Ado Ekiti, Nigeria. Pp. 301–302.

Dairo, F. A. S., Aina, O. O. and Asafa, A. R. 2005. Performance evaluation of growing rabbits fed varying levels of rumen content and blood rumen content mixture. *Nigerian Journal of Animal Production*, 32 (1): 67–72.

Duncan, D.B. 1955. Multiple Range Test and Multiple F-test. *Biometrics*, 11: 1–2.

Jain, N.C. 1986. Veterinary haematology. 4th ed. Lea–Febiger Publishers, Philadelphia, USA Pp: 153–159.

Mann, I. 1984. High protein from blood and ruminal content using solar drier. *World Animal Rev*iew, 50: 24–28.

Anonymous (2006). Biochemical Reference Values. *http://www.medirabbit.com/EN/Hematology_chemistry.htm*

Mohammed, G., Igwelbuke, J.U. and Kwari, I.D. 2005. Performance of growing rabbits fed graded levels of goat rumen content. *Global Journal of Pure and Applied Sciences*, 11 (1):39– 43.

Mohammed, G. Igwebuike, J. U., Ubosi, C.O. and Alade, N.K. 2008. Comparative study of the nutrient composition, Amino acid profile and microbial assay of fresh and dried cattle, camel, sheep and goat rumen content. Proceeding of the 13th Annual Conference of Animal Science Association of Nigeria. *(ASAN)*, ABU, Zaria, Sept. 15th -19thPp: 518–520.

Oyawoye, E.O. and Ogunkunle, M. 1998. Physiological and biochemical effects of raw jack beans on broiler. *Proceeding of Nigerian Society of Animal Production*, 23:141–142.

Schalm, O.W., Jain, N.C. and Carrol, E. 1975. Veterinary haematology. 3rd Edition Lea and Febiger, Philadelphia, USA. Pp. 160 – 210.

Spencer, K. and Price, C.P. 1997. Chemical analysis of bilirubin in biological fluid. *Annals of Clinical Biochemistry*, 14: 105 – 115.

Steel, R. G.D. and Torrie, J.H. 1980. Principles and Procedures of Statistics. A Biometrical Approach. 2nd ed. McGraw – Hill Book, Co; New York, USA. P: 633.

Uko, O.J., Ataja, A.M. and Tanko, H.B. 2000. Weight gain, haematology and blood chemistry of rabbit fed cereal offal. *Sokoto Journal of Veterinary Science*, 2: 18–26.

Whyte, E.P. and Wadak, I. 2002. Evaluation of rumen content on the growth performance of weaner rabbits. Proceeding 7th Annual Conference of Animal Science of Nigeria (ASAN) September, 16 –19. University of Abeokuta, Nigeria Pp: 143–146.