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EFFECT OF FEEDING DIFFERENT BLOOD-RUMEN CONTENT MIXTURES ON BLOOD PARAMETERS AND CARCASS MEASUREMENTS OF GROWING RABBITS

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ABSTRACT
A ten-week feeding trial was conducted to investigate the effect of blood-rumen content mixtures (BRCM) on the blood parameters and carcass measurements of cross-bred (Dutch x New Zealand) growing rabbits aged between five and seven weeks. Forty-five rabbits were randomly allocated to five dietary treatments and nine per treatment in randomized complete block design. Blood-rumen content mixtures (BRCM) of bovine, camel, sheep and goat were used in the diets. Diets 1, 2, 3, 4 and 5 contained 0% BRCM, 40% bovine blood-rumen content mixture (BBRCM), 40% camel blood-rumen content mixture (CBRCM), 40% goat blood-rumen content mixture (GBRCM) and 40% sheep blood-rumen content mixture (SBRCM) respectively. The response showed that the haematological parameters were not significantly affected ($P>0.05$) by the test material in the diets. Similarly, the serum biochemical components were also not affected by the inclusion of different blood-rumen content mixtures; only total protein and calcium were significantly affected ($P<0.05$) by the test materials in the diets. The thighs, lungs, kidneys and body length were not significantly ($P>0.05$) different among the treatment groups. The slaughter weight, dressed weight, dressing percentage and the other carcass components not mention above were significantly ($P<0.05$) different but no discernible trend was observed. The study indicated that up to 40% of the different blood-rumen content mixtures can be included in the diets of growing rabbits without adverse effect on blood and carcass parameters.

KEYWORDS: Growing Rabbits, Different Blood-Rumen Content Mixtures, Blood Parameters and Carcass Characteristics

INTRODUCTION

Rabbit, because of its obvious advantages over other livestock, is an animal that can efficiently solve the problem of animal protein shortage in most of the developing countries like Nigeria (Olabanji *et al*., 2009). Feeding, which constitutes up to 70% of the total cost in monogastric production, is a major factor limiting the production of livestock in most developing countries. Currently the search for non-conventional feed ingredients to replace the expensive conventional ones appears to occupy the attention of the animal nutritionists. The main aim of using these non-conventional feed ingredients is to reduce the feed cost and hence cost of production, thus making it possible for people to afford animal protein in their diets (Ojebiyi *et al*., 2006). Rumen content and blood, which are readily available in Nigerian abattoirs and slaughter houses, could be good sources of protein in rabbit diet if properly processed and harnessed. Some workers (Adeniji, 2001; Mohammed *et al*., 2011) recommended blood-rumen content mixtures as replacement for some of the conventional feeds in livestock diets. The objective of this study is to determine the effect of feeding up to 40% different blood-rumen mixtures on the blood parameters and carcass characteristics of the growing rabbits.

MATERIALS & METHODS

Experimental Animals and Management

The study was conducted at the Livestock Teaching and Research Farm, University of Maiduguri, Maiduguri, Borno State, Nigeria. A total of forty-five (45) rabbits (Dutch x New Zealand white), aged between five and seven weeks were used for the feeding trial which lasted for 10 weeks. Before commencement of the experiment, a one-week adjustment period was observed. During this period, the rabbits were treated against internal and external parasites by subcutaneous injection of Ivomec (0.2 ml/rabbit). The rabbits were individually weighed and divided into five groups. Each group was replicated thrice with three rabbits per replicate in such way as to ensure uniformity of average weight and sex of each group (six males and three females per treatment). The groups were randomly assigned to five dietary treatments. Each rabbit was individually housed in a wire cage measuring 38 x 33 x 45 cm. The cages, in rows, were raised 45 cm above the ground to facilitate cleaning. Each cage cell was equipped with plastic drinker and metal feeding trough. The experimental diets (in mash form) and clean drinking water were provided *ad libitum* throughout the experimental period. A total of 100 g of the feed was supplied to each rabbit; approximately 50 g of the feed was offered in the morning (8.00 am) and 50 g in the evening (3.30 pm).

Sources of Blood-Rumen Content Mixtures

The rumen contents were collected in Maiduguri abattoir from cattle, camel, goat and sheep. Blood was also collected from each species in a clean container during slaughter and the blood and rumen contents weighed in a ratio of 1:3 (i.e. 1 kg of blood and 3 kg of rumen content) into a drum. The blood and the rumen content were mixed

in the drum and boiled for 30 minutes with constant stirring to ensure a uniform mixture. The boiled blood–rumen content mixtures were sun-dried for 5 days on a clean dry slab. The dried samples were ground in a hammer mill and analysed for proximate composition.

Experimental Diets

The experimental diets are shown in Table 1. Maize, wheat offal, groundnut haulm, groundnut cake, bone meal, common salt, premix and blood-rumen content mixtures (BRCM) of bovine, camel, sheep and goat were used in the diets. Diets 1, 2, 3, 4 and 5 contained 0% BRCM, 40% bovine blood-rumen content mixture (BBRCM), 40% camel blood-rumen content mixture (CBRCM), 40% goat blood-rumen content mixture (GBRCM) and 40% sheep blood-rumen content mixture (SBRCM) respectively. The experimental diets were formulated to contain 18% crude protein (CP).

TABLE 1: Ingredient Composition of the Diets

Ingredients (%)	0% BRCM	40% BBRCM	40% CBRCM	40% GBRCM	40% SBRCM
Maize	40.98	24.35	24.35	24.35	24.35
Wheat offal	17.00	17.00	17.00	17.00	17.00
BBRCM	0.00	40.00	0.00	0.00	0.00
CBRCM	0.00	0.00	40.00	0.00	0.00
GBRCM	0.00	0.00	0.00	40.00	0.00
SBRCM	0.00	0.00	0.00	0.00	40.0
Groundnut cake	23.37	0.00	0.00	0.00	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**
Calculated Analysis					
Crude protein (%)	18.76	18.06	18.86	17.26	18.02
Crude fibre (%)	13.51	17.57	19.03	18.10	18.94
Ash (%)	4.26	4.61	4.51	4.91	4.51
Metabolizable Energy (Kcal/kg)	2560.67	2443.12	2411.12	2444.16	2423.72

* Premix (grow fast) Manufactured by Animal Care Service Consult (Nig) Ltd. Lagos, supplying the following per kg of premix: Vitamin A, 5000,00 IU; Vitamin D_3 800,000 IU; Vitamin E, 12,000 mg; Vitamin K, 1,5000 mg; Vitamin B_1, 1,000 mg; Vitamin B_2, 2,000 mg; Vitamin B_6, 1,500 mg; Niacin, 12,000 mg; pantothenic acid, 20.00 mg; Biotin,10.00 mg; Vitamin B_{12}, 300.00 mg; folic acid, 150,000 mg; choline, 60,000 mg; manganese, 10,000 mg; iron,15,000 mg; zinc, 800.00 mg; Copper, 400.00 mg; Iodine, 80.00 mg; cobalt, 40 mg; selenium 8.00 mg; 0% BRCM= Blood-rumen content mixture (Control); BBRCM= Bovine blood-rumen content mixture; CBRCM= Camel blood-rumen content mixture; GBRCM= Goat blood-rumen content mixture; SBRCM= Sheep blood-rumen content mixture

Blood Parameters

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 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 an 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) counts and white blood cell (WBC) counts and differential counts. Mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were obtained from calculation according to standard formulae (Jain, 1986). The other blood samples collected without anticoagulant 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 (Bush, 1975; Uko *et al*., 2000).

Carcass Measurements

At the end of the experiment, three rabbits (one rabbit from each replicate based on average weight) from each treatment, were selected for slaughter. They were deprived of feed for 12 hours as recommended by Joseph *et al.* (1994) but drinking water was provided. Withholding feed for 12 hours before slaughter reduced the volume of gut contents and hence bacteria, and therefore reduced the risk of contamination of the carcass during dressing without adversely affecting meat yield and quality (Joseph *et al*., 1994). The rabbits were weighed in the morning and slaughtered by cutting transversely across the trachea, oesophagus, large carotid arteries and jugular veins to ensure maximum bleeding (Mann, 1960). This slaughter method is in line with the accepted local practices. They

were later opened and dressed as described by Blasco *et al.* (1993). The dressed carcass is the portion of the rabbit remaining after the removal of the head, feet, skin (pelt), tail and visceral organs including kidneys. The dressed carcasses were split into retail cuts such as shoulder/foreleg, thigh/hindleg, rack and loin as described by Blasco *et al*. (1993). The dressed carcass and the retail cuts were weighed and expressed as percentage of slaughter weight.

Statistical Analysis

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

RESULTS & DISCUSSION

Haematological indices

The results of the haematological parameters are presented in Table 2. All the parameters were not affected (P>0.05) by the inclusion of different blood-rumen content mixtures. The values for packed cell volume (PCV) were close to the reference values of 31 to 50% while the Hb values fall within the normal ranges of 8 to 17g/100 (Anon., 1980) for healthy young rabbits. Blood is an important index for the assessment of the physiological, pathological and nutritional status in the rabbits (Olorode *et al*., 2007).

TABLE 2: Haematological Indices in Rabbits Fed different Blood- Rumen Content Mixtures of bovine, camel, goat and sheep

Levels of inclusion of the different blood-rumen content mixture						
Indices	0% BRCM	40% BBRCM	40% CBRCM	40% GBRCM	40% SBRCM	SEM
PCV (%)	26.00	25.70	26.00	29.00	26.33	1.36^{NS}
Haemoglobin (Hb) (g/100 ml)	11.27	11.00	10.67	11.80	11.00	0.56^{NS}
RBC ($x10^6/mm^3$)	2.09	2.23	2.29	1.71	1.69	0.73^{NS}
WBC ($x10^3/mm^3$)	2.40	2.87	2.83	2.83	2.80	0.37^{NS}
MCV (fl)	120.40	121.50	142.00	123.04	130.27	42.59^{NS}
MCH (pg)	24.18	23.63	23.52	23.95	23.75	0.60^{NS}
MCHC (%)	43.32	43.57	41.03	40.77	41.77	3.01^{NS}
Differential counts.						
Monocytes (%)	2.33	1.67	2.00	1.00	1.33	0.37^{NS}
Basophils (%)	1.50	1.00	1.00	1.00	1.00	0.16^{NS}
Neutrophils (%)	38.67	37.00	35.33	37.33	33.33	2.63^{NS}
Eosinophils (%)	1.67	2.67	2.00	2.00	1.67	0.69^{NS}
Lymphocytes (%)	56.33	57.67	60.00	59.33	63.00	2.67^{NS}

SEM = Standard error of means, NS = Not significant (P> 0.05). PCV = Packed cell volume, Hb= Haemoglobin, RBC = Red blood cells count, WBC = White blood cells count, MCV = Mean corpuscular volume, MCH = Mean corpuscular haemoglobin, MCHC = Mean corpuscular haemoglobin concentration, 0% BRCM= Blood-rumen content mixture (Control), BBRCM= Bovine blood-rumen content mixture, CBRCM= Camel blood-rumen content mixture, SBRCM=Sheep blood-rumen content mixture, GBRCM = Goat blood-rumen content mixture

Reports by Aletor (1989) indicated that the blood variables, most consistently affected by diets include packed cell volume (PCV), haemoglobin (Hb) and plasma protein. However, the different blood-rumen content mixtures had no effect on these parameters. The red blood cell counts (RBC) and white blood cell counts (WBC) obtained in this study are close to the reference values of 8.0 x $10^6/mm^3$ and 3.0 to 12.5 x $10^3/mm^3$ respectively reported by Anon. (1980). This slight variation may be due to high ambient temperature prevalent during the time of blood sampling. Igwebuike (2001) reported low WBC count for rabbits under high ambient temperature (36.0 to 40 ^oC) and attributed this to thermal stress which is known to induce immune – depression in rabbits. The mean corpuscular volume (MCV) values obtained in this study range from 120.40 - 142.00 fl which is above the range of 38.38 – 49.88 fl reported by Mohammed *et al*. (2005) who fed goat rumen content to growing rabbits. The slightly elevated values of the MCV of the rabbits are indication of mild anaemia as reported by other workers (Abu *et al*., 1999). However, this observation may not be due to inclusion of different blood-rumen content mixture in the diets since the control (0% BRCM) group exhibited a similar response. The MCH and MCHC values obtained here (23.52 to 24.18 pg and 40.77 – 43.57%) are close to the reference values of 16 to 23 pg and 26 to 34% (Anon., 1980) respectively.

The differential counts (neutrophils, lymphocytes, eosinophils and basophils) were not influenced (P>0.05) by dietary treatments. They were, however, within the normal physiological range for rabbits (Ahamefule *et al*., 2003) and this indicated that rabbits immune systems were not challenged by antigen (toxin) probably from the diets. This report agreed with other workers (Ezeagu *et al*., 2002) who observed that well-balanced diets provide proper nourishment to animals, and the essential amino acids and minerals necessary for the normal functioning of the haematological tissues.

Serum Biochemical indices

The results of serum biochemical indices of rabbits fed the experimental diets are shown in Table 3. The Total protein examined were significantly (P<0.05) affected by the dietary treatments. Total protein concentration were higher in rabbits fed 40% BBRCM and 40% CBRCM diets compared to those fed control and 40% SBRCM diets, but similar to 40% GBRCM diet.

TABLE 3: Serum Biochemical Indices in Rabbits Fed Diets Containing Different Blood- Rumen Content Mixtures of Bovine, Camel, Sheep and Goat

	Levels of inclusion of the different blood-rumen content mixtures					
Parameters	0% BRCM	40% BBRCM	40% CBRCM	40% GBRCM	40% SBRCM	SEM
Total protein (g/dl)	6.16 ^{c}	7.14 ^{a}	7.07 ^{a}	7.01 ^{ab}	6.38 ^{b}	0.58*
Albumin (g/dl)	3.90	3.54	3. 58	3.34	3.38	0.52 ^{NS}
Globulin (g/dl)	2.26	3.60	3.49	3.67	3.00	0.31^{NS}
Glucose (mg/dl)	83.14	81.52	83.72	81.84	83.08	2.00 ^{NS}
Cholesterol (mg/dl)	49.11	48.44	49.07	48.44	49.04	0.03^{NS}
Calcium (mg/dl)	8.33 ^{a}	7.81 ^{ab}	8.18 ^{ab}	7.46 ^{b}	7.81 ^{ab}	0.36*
Phosphorus (mg/dl)	3.77	3.98	4.13	3.68	3.57	0.40^{NS}

SEM = Standard error of mean; NS = Not significant (P> 0.05);*= significant (P< 0.05); a, b, c = Means in the same row bearing different superscript differ significantly (P<0.05) ; 0% BRCM= Blood-rumen content mixture (Control); BBRCM= Bovine blood-rumen content mixtures; CBRCM= Camel blood-rumen content mixtures; SBRCM= Sheep blood-rumen content mixtures; GBRCM = Goat blood-rumen content mixtures

This implies that rabbits on the test ingredients utilized the dietary protein from different blood-rumen content mixtures effectively. The values reported here are within the normal range of 5.0 to 8.0 g/dl reported by Anon. (1980). The normal values obtained in this study indicate nutritional adequacy of the dietary protein. Schalm *et al*. (1975) reported that normal total protein value is a function of the nutritional status, water balance and other factors affecting the state of health of the animal. Albumin and globulin of rabbit fed BRCM – based diets were not significantly (P>0.05) different from those fed the control diet. The values reported here for albumin are within the normal range of 2.5 to 4.0 g/dl while values (2.26 – 3.67 g/dl) of globulin were close to the normal range of 2.15 to 2.8 g/dl reported by Anon. (1980). The similarity in the values observed for rabbits fed different blood-rumen content mixtures and control diet suggests sufficient or adequate protein in the experimental diets. Glucose and Cholesterol of the experimental rabbits were not significantly (P>0.05) influenced by the dietary treatments. The values for glucose levels fall within the normal range of 65.89 to 87.43 mg/dl (Anon., 1980). 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. Cholesterol levels fall within the reference range of 20 to 83mg/dl (Anon, 1980). No defined change in cholesterol level was produced by different blood-rumen mixtures incorporated into the diets. Since cholesterol levels are within the normal range, the problems of severe liver dysfunction and mal-absorption of fat (Bush, 1975) observed in abnormal levels are ruled out. Rabbits fed control (0% BRCM) diet had significantly (P<0.05) higher calcium than the rabbits fed 40% GBRCM diet but did not differ (P>0.05) from rabbits fed 40% BBRCM, 40% CBRCM and 40% SBRCM diets. The phosphorus values were similar (P>0.05) among the groups. The similarity in phosphorus levels of the blood in all the diets conforms to the observation of Mohammed *et al*. (2005) who fed goat rumen content mixture to growing rabbits of similar ages.

Carcass Characteristics

The slaughter weight, dressed weight and organ measurements (expressed as percentage of slaughter weight) of the experimental rabbits are presented in Table 4. The slaughter weight, dressed weight, dressing percentage, shoulder, rack, loin, skin, head, heart, liver, stomach, caecum, large intestine and small intestine were significantly (P<0.05) different among the groups. The slaughter weight and dressed weight of rabbits fed control (0% BRCM) diet had significantly (P<0.05) heavier weight compared to rabbits fed 40% BBRCM, 40% CBRCM and 40% SBRCM diets but similar to the rabbits fed 40% GBRCM diet. Rabbits fed BRCM – diets had similar slaughter weight and dressed weight. This agrees with the observation on final body weight as showed in Table 4. Dressing percentage and heart of rabbits fed control diet had significantly (P>0.05) higher values than the rabbits fed 40% BBRCM but similar to other groups. The dressing percentages obtained in this study (44.00 to 49.08%) were close to the 50% reported by Fielding (1991). Fielding (1991) observed that dressing percentage will tend to be 50% or less if rabbits slaughter is young or thin. Rabbits fed control (0% BRCM) had significantly (P<0.05) heavier shoulder compared to 40% BBRCM and 40% GBRCM diets, but did not differ from rabbits fed 40% CBRCM and 40% SBRCM diets. However, rabbits fed BRCM – based diets recorded similar (P>0.05) values. The rack of rabbits fed 40% CBRCM and 40% GBRCM were heavier (P<0.05) than the 40% BBRCM, but similar to control (0% BRCM) and 40% SBRCM diets. The loin of rabbits fed control were significantly (P<0.05) heaver than 40% CBRCM, but similar to other groups. Skin of rabbits fed 40% SBRCM was heavier than the 40% GBRCM, but similar to other groups.

The head expressed as percentage of slaughter weights were higher in rabbits on 40% BBRCM, 40% CBRCM and 40% SBRCM diets than the control and 40% GBRCM diets. This agrees with the report of Igwebuike (2001) who observed similar trend. Igwebuike (2001) reported that in undeveloped or small rabbits their heads will be large in proportion to the rest of their body. Rabbits fed 40% BBRCM, 40% GBRCM and 40% SBRCM diets had significantly (P>0.05) heavier stomach than the rabbits fed control (0% BRCM) diet, but did not differ (P>0.05) from those fed 40% CBRCM diet. Caecum of rabbits fed 40% SBRCM was superior to control and 40% GBRCM, but there was no significant (P>0.05) difference between 40% BBRCM and 40% CBRCM diets. Rabbits fed 40%

BBRCM diet had significantly (P<0.05) heavier large intestine and small intestine than control and 40% SBRCM, but similar to 40% CBRCM and 40% GBRCM. The heavier weight of the large intestine and small intestine of rabbits on BRCM – based diets may be attributed to higher fibre of these diets. Cheeke (1987) reported increase in weight and length of the various segments of the gastro-intestinal tract in rabbits fed high fibre diets. He explained this as an adaptation to accommodate more feed to compensate for the reduced energy density of high fibre diets. However, the values recorded for carcass measurements and organ weights were similar to the values reported by Doma and Adegbola (1999) who slaughtered rabbits of comparable weights and ages. thighs, lungs, kidneys and body length were not influenced (P>0.05) by the test materials. This indicates that the growth and development of these body components and organs were not adversely affected by different blood-rumen content mixture in the diets.

TABLE 4: Carcass Measurements and Organs of Rabbits fed different Blood- Rumen Content Mixture Expressed as Percentage of Slaughter Weight

Levels of inclusion of the different blood-rumen content mixtures						
Parameters	0% BRCM	40% BBRCM	40% CBRCM	40% GBRCM	40% SBRCM	SEM
No. of rabbits	3	3	3	3	3	-
Slaughter weight (g)	1,159.30^{a}	862.70^{b}	923.00^{b}	999.00^{ab}	882.70^{b}	52.66*
Dressed weight (g)	570.33^{a}	380.33^{b}	421.67^{b}	461.00^{ab}	414.00^{b}	35.73*
Dressing percentage	49.08^{a}	44.00^{b}	45.60^{ab}	46.10^{ab}	46.68^{ab}	1.40*
As % of slaughter weight						
Shoulder/forelegs	14.49 ^{a}	12.44 ^{b}	13.34 ^{ab}	13.15 ^{b}	13.43 ^{ab}	0.38*
Rack	3.83 ^{ab}	3.15 ^{b}	4.17 ^{a}	4.39 ^{a}	3.65 ^{ab}	0.29*
Loin	9.97 ^{a}	8.69 ^{ab}	7.14 ^{b}	8.28 ^{ab}	8.62 ^{ab}	0.74*
Thighs/Hind legs	20.53	19.71	20.87	20.00	20.81	0.38 ^{NS}
Skin/pelt	7.54 ^{ab}	7.41 ^{ab}	7.49 ^{ab}	6.63 ^{b}	7.82 ^{a}	0.33*
Tail	0.50	0.26	0.46	0.54	0.45	0.11 ^{NS}
Head	9.97 ^{c}	10.59 ^{abc}	11.06 ^{ab}	10.39 ^{bc}	11.41 ^{a}	0.27*
Feet	3.20	2.99	3.09	3.00	3.98	0.37^{NS}
Heart	0.40 ^{a}	0.19 ^{b}	0.28 ^{ab}	0.26 ^{ab}	0.29 ^{ab}	0.05*
Liver	3.71 ^{b}	3.74 ^{b}	3.68 ^{b}	4.56 ^{a}	3.54 ^{b}	0.20*
Lungs	0.85	0.62	0.53	0.63	0.73	0.11^{NS}
Kidneys	0.86	0.91	0.79	0.83	0.82	0.07^{NS}
Stomach	5.30 ^{b}	8.73 ^{a}	7.58 ^{ab}	8.84 ^{a}	8.60 ^{a}	0.78*
Caecum	3.96 ^{b}	5.05^{ab}	5.02^{ab}	4.24^{b}	5.59^{a}	0.41*
Large intestine	2.05^{b}	2.77^{a}	2.53^{ab}	2.29^{ab}	2.16^{ab}	0.19*
Small intestine	3.02^{b}	4.76^{a}	4.06^{ab}	3.79^{ab}	3.86^{ab}	0.44*
Body length (cm)	28.00	28.12	28.12	28.01	28.21	0.52 ^{NS}

SEM = Standard error of means; NS = Not significant (P> 0.05); *= Significant (P< 0.05); a,b,c = means in the same row bearing different superscripts differ significantly (P< 0.05),BBRCM= Bovine blood-rumen content mixtures; CBRCM= Camel blood-rumen content mixtures; GBRCM= Goat blood-rumen content mixtures; SBRCM= Sheep blood-rumen content mixtures

CONCLUSION

Based on the haematological and biochemical findings and carcass characteristics of rabbits, up to 40% BRCM can be included in the diets of growing rabbits. This is a good indication that this level of different blood-rumen content mixtures (BRCM) can be fed to growing rabbits without compromising the health status and carcass yield of the rabbits. However, there is need for further study on the histopathology of some selected organs of rabbits.

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