

Significance of Camel Rumen Content as a Feed for Broiler Chickens

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Abstract: *This study was carried out to evaluate the growth performance, carcass characteristics and haematological parameters of broiler chickens fed diets containing graded levels of Camel Rumen Content (CRC) as a replacement for maize and groundnut cake. CRC was included in the diets of broilers at 0, 5, 10, 15, and 20% and designated as T1, T2, T3, T4 and T5 respectively. Five dietary treatments were formulated. One hundred and fifty day-old broiler chicks (Anak breed) were randomly allotted to five treatments replicated thrice with 10 chicks per replicate in a completely randomized design. Feed and water were supplied ad libitum for 28 days. Means of body weight gain, feed intake and feed conversion ratio of broilers fed the control diet, 5%, 10% and 15 % CRC diets were significantly ($P < 0.05$) better than those fed 20 % CRC diet. Carcass characteristics of birds followed similar pattern with the growth performance. There were no significant ($P > 0.05$) differences in the haematological parameters measured except haemoglobin and mean corpuscular haemoglobin concentration. Also, basophils and monocytes were not significantly ($P > 0.05$) different among the differential counts measured. It was concluded that up to 15% CRC can be included in broilers diet to replace maize and groundnut cake without adverse effect on the performance of birds.*

Keywords: Broiler chickens, camel rumen content, performance, haematology, carcass

1. Introduction

In Nigeria, the supply of protein from animal origin such as egg, meat and milk falls short of demand because of the rapid increase in human population and the competition for feedstuff between the increase human population and livestock sector. Most Nigerians are poorly fed and are suffering from malnutrition due to lack of protein of animal protein [1]. High cost and scarcity of conventional feedstuffs constitute major problems facing commercial livestock production in developing and underdeveloped countries. Unconventional feedstuffs, which are usually of no feeding value to humans, are much cheaper. One of such is abattoir waste particularly rumen contents (RC). Rumen contents are gotten from the rumen of camels, buffalos, cattle, sheep and goats etc. In Nigeria, ruminant animals are the major source of animal protein with large numbers being slaughtered daily resulting in concomitant higher production of RC. Previous studies have generally indicated that dried rumen contents (DRC) contained substantial amount of crude protein (CP) and utilizable energy for ruminants [7]. Rumen content is rich in microbial protein [21] and contains digested feed at different stages of degradation, saliva (making up the rumen liquor), microorganisms and the products of their metabolic activities such as proteins, peptides, amino acids, lipids, vitamins and volatile fatty acids. Despite these qualities, the nutritional potentials of RC in concentrate based diets remain currently under-researched in Nigeria. The present study was designed to determine the effects of feeding different levels of Camel Rumen Content on the growth performance, carcass characteristics and haematological parameters of broiler chickens.

2. Materials and Methods

Experimental site

The research was conducted at the Department of Animal Science Teaching and Research Farm, University of

Maiduguri. The research area lies between latitude 1050 North and longitude 30.050 East and is on latitude of 364m above sea level [8]. Mean relative humidity ranges from 30-50% with a maximum of about 90% in the month of August [16]. The research area falls within the semi arid zone of West Africa characterized by short rainfall ranging from 300mm-700mm per annum and falls mostly between May and October with temperature ranging from 330 C - 440 C [1].

Management of Experimental birds

One hundred and fifty (150) one day old chicks were purchased from a reputable hatchery in Enugu State and used for the research. The chicks were randomly allotted to five (5) treatments in groups of 30 birds per treatment. Each treatment was replicated thrice with 10 birds per replicate in a completely randomized design. The birds were raised in a deep litter system for 28 days. Feed and water were supplied ad libitum.

Collection rumen content and Processing of camel

Camel rumen contents were collected from Maiduguri abattoir, Borno State. After slaughtering, the rumen was split open with aid of sharp butcher's knife and the contents emptied into a polythene bags. It was allowed to drain in the sack. After draining, the rumen contents were then spread on a cemented floor and allowed to sundry while turning was done between 3-4 hours interval until the moisture content was below 15% after 4 -5 days of sun drying. The dried rumen content was then ground and incorporated into the diets.

3. Experimental Diets

Five experimental diets were formulated using the following ingredients: maize, wheat offal, bone meal, groundnut cake, fish meal, common salt, premixes and dried camel rumen content as shown in Table 2. Camel rumen content serves as a test ingredient to replace maize and groundnut cake at 0, 5, 10, 15, and 20% in diets 1, 2, 3, 4, and 5 respectively.

Table 1: Proximate composition of Camel Rumen content

Nutrients, %	Composition
Dry matter	93.7
Crude protein	23.7
Crude fibre	28.1
Ether extract	3
Ash	12
Nitrogen free extract	56.9
Metabolizable energy, Kg/kcalME	2070.85

Table 2: Gross composition of Experimental diets

Ingredients, Kg	0% CRC	5% CRC	10% CRC	15% CRC	20% CRC
Maize	56.29	53.67	51.04	48.40	45.78
Groundnut cake	24.96	22.58	20.21	17.85	15.47
CRC	0.00	5.00	10.00	15.00	20.00
Wheat offal	12.00	12.00	12.00	12.00	12.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
*Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00

Proximate Composition, %

Dry matter	89.20	87.90	90.00	87.30	89.30
Crude protein	21.90	22.00	21.10	21.00	21.90
Crude fibre	3.63	4.49	6.13	7.38	8.62
Ether extract	3.00	3.50	2.00	2.50	2.50
Ash	2.50	2.50	3.00	3.00	3.00
NFE	56.17	53.01	55.27	51.42	51.28
M.E (Kcal/kgME)	3121.34	3053.36	3015.79	2934.91	2907.24

CRC – Camel Rumen Content. NFE= Nitrogen free extract. ME=Metabolizable energy. *Premix in diets provided per kg: Vit. A 10000 IU, Vit. B 2000 IU, Vit. E 13000 IU, Vit. K 1500mg, Vit. B12 10mg, Riboflavin 5000mg, Pyridoxine 1300mg, Thiamine 1300mg, Panthothenic acid 8000mg, Nicotinic acid 28000mg, Folic acid 500mg, Biotin 40mg, Copper 7000mg, Manganese 48000mg, Iron 58000mg, Zinc 58000mg, Selenium 120mg, Iodine 60mg, Cobalt 300mg, Choline 27500mg.

Performance data

The amount of feed given and left over was recorded on daily basis and it was used to calculate the feed intake. Before the commencement of the experiment, the initial weight of the birds were taken and the birds were weighed weekly thereafter to obtain weekly weight gain. Feed intake and weight recorded were used to calculate feed conversion ratio (FCR) using the formula below.

Feed conversion ratio (FCR) = feed intake/weight gain

Blood collection

At the end of the study period, 5ml of blood was collected from three birds per treatment through the wing vein and put into bottles containing Ethylene Diaminetetra- acetic Acid (EDTA) to determine the haematological indices which include packed cell volume (PCV), haemoglobin concentration (Hb), red blood cell (RBC) count or erythrocytes and white blood cell (WBC) count or leucocytes and differential counts. Others such as mean

corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were obtained by calculation according to standard formulae by [17] as shown below:

$$MCV = \frac{PVC \times 10}{RBC \text{ count (in } 10^6/\text{mm}^3)}$$

$$MCH = \frac{Hb \text{ (g/dl)} \times 10}{RBC \text{ (in } 10^6/\text{mm}^3)}$$

$$MCHC = \frac{Hb \text{ (g/dl)} \times 100}{PCV\%}$$

Carcass and Organs Weight determination

At the end of the study, two birds per replicate were selected at random and starved for about 12h to empty the crops. They were then slaughtered, scalded, plucked and eviscerated. The carcass and internal organs (liver, heart, kidney, gizzard and intestines) were removed, weighed and expressed as a percentage of live weight.

Chemical analysis

Proximate composition of CRC and experimental diets were analysed using the methods described by [9].

Statistical analysis

Data collected were subjected to analysis of Variance using software [27] while significant means were separated with Duncan multiple range test at 5% level of significance.

4. Results and Discussion

Proximate Composition of the Experimental Diets

The result of the proximate composition of the camel rumen content used in this study is presented on Table 1. The result shows that camel rumen content (CRC) contained 23.70 % crude protein, 28.10 % crude fibre, 3.00 % Ether extract, Ash, 33.70 % NFE and 2316.25 Kcal/kg ME. This result differs from the report of (4) who reported that dried bovine rumen digesta contains 18.20 % moisture, 15.30 % crude fibre, 18.52 % crude protein, 7.60% ash, 8.79% ether extract and 38.39% NFE. [30] gave the following as the composition of bovine rumen content: moisture 9.69%, crude fibre 39.95%, crude protein 9.82%, fat 1.10%, NFE 30.55% and Ash 18.58%. Therefore, CRC provides a richer source of nutrients suitable of exploitation for use as possible feed ingredient.

Growth Performance

The performance of broiler starter chickens fed graded level of camel rumen content (CRC) is presented in Table 3. The daily feed intake, daily weight gain and feed conversion ratio were significantly (P<0.05) different among the treatment groups. Birds fed 20 %CRC consumed significantly (P<0.05) more feed than birds fed other diets. The variations in the feed intake of birds across the dietary groups may be attributed to the differences in the fibre content of the diets. The diet with 20 %CRC contained about 8.62% crude fibre. Some authors [4, 20] had earlier reported that feed intake of birds increased with increased levels of fibre in diet because the birds eat to meet their energy requirement. Similarly, the observation in this study agrees with the report of [4] who reported that although birds fed

diets containing dried rumen digesta recorded better feed intake, feed cost per kilogramme body weight gain, feed conversion ratio and relative organ weights than those fed the control diet, only feed intake of the birds was significant ($P < 0.05$). Daily weight gain of birds fed 0 %CRC, 5 %CRC, 10 %CRC and 15 %CRC were similar ($P > 0.05$) and higher ($P < 0.05$) than birds fed 20 %CRC diet. This means that inclusion of CRC up to 20% in the diets of broilers affect the daily weight gain of the birds. [3,15] fed rumen content to broilers and revealed that there was a decrease in daily

weight gain of birds as the levels of CRC increased in the diets. The feed conversion ratio of birds fed 0 %CRC, 5 %CRC, 10 %CRC and 15 %CRC were similar ($P < 0.05$) and better than those fed 20 %CRC diet. [22] observed significant differences in feed conversion ratio of broiler chickens fed sun-dried rumen content blood meal diets. [12] However reported no significant difference in the feed conversion ratio of birds fed graded levels of dried rumen digesta.

Table 3: Performance of broiler chicken fed camel rumen content (0-8 weeks)

Parameters	0%	5%	10%	15%	20%	SEM
Initial wt, g/b	34.34	35.19	34.35	35.82	34.50	0.74
Final wt, g/b	2082.10a	2057.10a	994.60a	1969.00 a	1646.70 b	72.55
Av. Wt gain, g/b	2047.76a	2021.91 a	1960.25 a	1933.18a	1612.20 b	70.35
Daily wt gain, g/b	36.57 a	36.11 a	35.00 a	34.52a	28.79 b	1.26
Total feed intake, g/b	4307.24b	4102.84bc	4585.00ab	4321.52b	4723.88a	135.26
Daily feed intake, g/b	6.92b	73.27bc	81.88 ab	77.17b	84.36 a	2.42
FCR	2.10a	2.03 a	2.34 a	2.22 a	2.93 b	0.25

a, b, c= Means in the same row bearing different superscripts differ significantly ($P < 0.05$). CRC=camel rumen content.

Carcass characteristics

The results of carcass characteristics and internal organs weight are presented in Tables 4 and 5. Final live weight, carcass weight and dressing percent were significantly ($P < 0.05$) lower in birds fed diet 20 %CRC compared to birds fed other diets. Birds fed 10 %CRC diet had the highest carcass weight and dressing percent. The primal cuts (the breast, thigh and back) expressed as percentage of dressed weight of experimental birds were significantly ($P < 0.05$) affected by dietary treatments. Birds fed 20 %CRC diet had similar weight of breast as birds fed the control diet. There were no significant ($P < 0.05$) differences among treatments for organs weights such as heart, kidney and gizzard and this implies that there were no abnormalities or pathological lesions in these organs. [12] observed insignificant

differences in the organs weight of broiler finishers fed fermented bovine blood and rumen digesta. The intestine length and weight significantly ($P < 0.05$) increased as the level of CRC increased in the diets. The linear increase in the weights of the intestine across the treatments may be due to their involvement in the digestion process. The weight of liver was significantly ($P < 0.05$) higher in birds fed 20 %CRC diet compared to other treatments. The higher value of liver as observed in 20 %CRC could be as a result of anti-nutritional factors in the feed that produces toxicity causing inflammation of and friable liver. [10] reported that higher values of organs probably indicate hypertrophy. In any case, it was observed that the values of all the parameters investigated were within the values reported for healthy poultry birds of similar age [22].

Table 4: Carcass Characteristics of Broiler Fed Graded Levels of Camel Rumen Content (CRC)

Parameters	0%CRC	5%CRC	10%CRC	15%CRC	20%CRC	SEM
Final live weight, g	2274.00a	2238.00 a	2278.33a	2203.67a	2112.33b	41.79
Dressed weight, g	2030.00a	2017.00a	2041.00a	1945.00ab	1887.33b	48.03
Dressing Percentage, %	73.13ab	72.17ab	76.37a	70.22ab	69.85b	3.24
Carcass weight, g	1663.33ab	1616.67ab	1733.33a	1571.67b	1495.00b	64.45
Breast weight, %	22.34a	18.89b	18.23b	18.42b	20.63ab	1.37
Thigh weight, %	25.81a	22.93b	22.77b	21.41c	23.84ab	1.06
Back weight, %	16.81a	15.86ab	16.53ab	15.99ab	15.54b	0.51
Heart weight, %	0.50	0.52	0.53	0.53	0.55	0.06

a, b, c = Means in the row bearing different superscript differs significantly ($p < 0.05$). CRC = camel rumen content

Haematological parameters and differential counts of broiler finishers fed graded levels of camel rumen content (CRC)

The haematological parameters and differential count are shown on Table 6 Changes in haematological parameters are of value in assessing the responses of animals to various physiological and disease conditions [14]. Changes in haematological parameters are often used to determine stresses due to nutrition and other factors ([5]. Results obtained from the packed cell volume (PCV), Red blood cell (RBC) and white blood cell (WBC) of the broiler chickens were not significantly ($P > 0.05$) different among the treatment groups. The values fall within the normal range for healthy broiler chickens reported by [5]. The haemoglobin

concentration (Hb) were significantly ($P < 0.05$) different among the treatment groups. Birds fed 0 %CRC, 10 %CRC, 15 %CRC and 20 %CRC diets had similar values that were superior to birds fed 5 %CRC diet. This result is similar to the report of [12] who fed graded levels of bovine rumen content in broiler diets. Mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) were not significantly affected ($P < 0.05$) by the dietary treatments. Mean corpuscular haemoglobin concentration (MCHC) was significantly ($P < 0.05$) different across the treatment groups. The MCHC for 0% CRC, 10% CRC, 15% CRC and 20% CRC were similar and higher than 5% CRC. The values of MCV, MCH and MCHC observed in this study are within the normal range reported by (Igene, F.U., 199). The MCV,

MCH and MCHC are derived from red blood cells, haemoglobin, packed cell volume contents and concentration and they are readily used in the assessment of

nutritional status of the chicken as a result of the feed ingested [26].

Table 5: Organs of Weight of Broiler fed Graded Levels of Camel Rumen Content (CRC)

Parameters	0%CRC	5%CRC	10%CRC	15%CRC	20%CRC	SEM
Liver weight, %	1.66b	1.69b	1.77b	1.80b	2.11a	0.14
Kidney weight, %	0.50	0.49	0.52	0.54	0.56	0.06
Gizzard weight, %	1.91	1.93	2.18	2.13	2.20	0.20
Intestine weight, g	4.10b	3.86b	3.96b	4.97a	5.28a	0.36
Intestine length, cm	9.57c	10.45b	10.45b	11.07ab	11.92a	0.49

a, b, c = Means in the same row bearing different superscripts differ significantly (p<0.05). CRC = camel rumen content

Table 6: Haemathological parameters of broiler finisher fed graded level of camel rumen content

Parameters	0%CRC	5%CRC	10%CRC	15%CRC	20%CRC	SEM
PCV (%)	43.50	42.50	43.25	43.00	43.50	1.27NS
RBC (X106/mm3)	4.03	4.03	4.06	3.77	3.98	0.16NS
WBC (X103/mm3)	4.19	4.16	4.30	4.25	4.15	0.04NS
Hb (g/100ml)	12.23a	11.13b	11.6ab	11.48ab	11.58ab	0.44*
MCV (fl)	10.65	10.57	10.65	10.82	11.20	0.36NS
MCH (pg)	29.90	27.68	28.74	28.88	29.14	1.09NS
MCHC (%)	28.12a	26.17b	26.99ab	26.80ab	26.61ab	0.73*
Differential counts (%)						
Basophils	0.10	0.25	0.25	0.10	0.25	0.27NS
Eosinophils	7.00b	7.50ab	8.75a	7.00b	7.50ab	0.65*
Heterophils	34.00ab	33.50b	35.75a	35.50a	34.00ab	0.91*
Monocytes	7.75	7.25	8.50	8.00	7.00	0.79NS
Lymphocytes	50.75ab	50.50a	47.25b	49.00ab	51.75a	1.61*

a,b =Means in the same row bearing different superscripts differ significantly (P<0.05). SEM= Standard error of mean.
 CRC=camel rumen content. PCV=Packed Cell volume. RBC=Red blood cell. WBC=White blood cell. Hb=Haemoglobin.
 MCV= Mean corpuscular volume.MCH= Mean corpuscular haemoglobin. MCHC=Mean corpuscular haemoglobin concentration

Differential Counts (%)

The differential counts (%) are divided into granulocytes which are nucleated white blood cells and comprise of (basophils, eosinophils and heterophils) and agronulocytes which are nucleated white blood cells all comprised of monocytes and lymphocytes. These parameters are associated with body defence mechanism. The basophils and monocytes were not significantly different (P<0.05) across the treatment groups. The values were similar and fall within the normal range for healthy chicken as reported by (Campbell *et al.*, 2003). Eosinophils, heterophils and lymphocytes were significantly (P>0.05) affected by the dietary treatments. The heterophils of birds fed 0 %CRC, 10 %CRC, 15 % CRC and 20 % CRC were higher than birds fed 5 % CRC diet. The lymphocytes was significantly (P<0.05) higher in birds fed 0 %CRC, 5 %CRC, 15 %CRC and 20 %CRC than birds fed 10 %CRC diet. These results fall within the normal range of healthy chicken reported by [16] indicating that the diets fed had no harmful effect on the health status of the birds.

5. Conclusion

The study indicates the potential of camel rumen content (CRC) in the diet of broilers. The result of this study showed that up to 15% CRC can be included in the diet of broilers to replace maize and groundnut cake. Beyond this level, growth parameters may be affected as observed in this study.

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