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Research Paper

Response of Finisher Broiler Fed Dietary Levels of Cattle Rumen Content

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Abstract
The study was conducted to evaluate the performance, carcass and organs characteristics of broiler chickens fed varying dietary levels of cattle rumen content.A total of eighty four pieces of four weeks old Ross 308 broiler birds were used in this experiment,these birds were randomly assigned to four treatment groups in a completely randomized design involving group A= birds on 0% cattle rumen content, B= birds on 5% cattle rumen content meal, C= birds on 10% cattle rumen content meal and D= birds on 15% cattle rumen content meal. Each treatment group was replicated trice to obtain a total of 12 replicates of 7 birds each. The chickens were randomly assigned to experimental pens of 1m x 1m each and raised in a deep liter system of management. Feed and water were provided ad-libitum, proper routine management practices and medications was strictly adopted. The trial lasted for twenty eight (28) days. The results of the performance of the experiment showed no significant difference (P> 0.05) was observed among all the treatments for average final weight. However, daily feed intake and daily weight gaindecreased significantly (P< 0.05) for the birds on groupD.In same manner, there was a significant decrease(P< 0.05) in the feed conversion ratio as cattle rumen content increased in the feeds of the birds in group B, C and D when compared to the control birds. The carcass characteristics showed no significant difference (P> 0.05) among all the parameters considered except for theeviscerated weight of the birds on group D which was significantly lower than other treatment groups (P< 0.05).for the organ characteristics, no significant differences (P> 0.05) were observed among all the parameters considered except for the liver in which the birds on treatment group B had decreased value when compared to the control (P< 0.05).In conclusion, the findings of the study is an evidence that cattle rumen content can be incorporated in finisher broilers diets upto 15% without compromising the growth performance of the birds.

Key words*: performance, Response, carcass, rumen content, cow*

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I. Introduction

There are numerous reviews on the use of Cattle rumen content which is often referred to as rumen by-products or rumen fill, it is a valuable resource in livestock nutrition, particularly for ruminants. The rumen of cattle plays a crucial role in digesting fibrous plant materials through a unique microbial ecosystem (Baker et al., 2019). This ecosystem is rich in microbial protein, vitamins, and minerals, making rumen content a potential feed resource when properly processed. The nutrient profile of rumen content includes significant amounts of protein, primarily from microbes, which are considered high-quality due to their amino acid composition. According to Makkar and Becker (1999), including microbial protein from rumen content in livestock diets can enhance growth rates and improve feed efficiency. This is particularly beneficial in regions where feed resources are limited or expensive.

Furthermore, utilizing cattle rumen content aligns with sustainable agricultural practices. It minimizes waste by repurposing a by-product of the beef industry, thus contributing to a circular economy in animal production (Duncan et al., 2006). As the global demand for protein continues to rise, broiler production is considered to be one of the shortest means of providing animal protein. However, the cost of feeding has

escalated the production cost which has made chicken to be unaffordable to an average Nigerian, although animal scientists have explored different ways to proffer solutions such as using agricultural by products and agro by products as alternative feed materials, feed regimentation to mention but a few but these seem not to have much effect as the materials are seasonal, therefore not always available.To this ends this study is carried out to explorethe activities of microbes in cattle rumen content as alternative feed sources to provide an innovative solution to feed shortages while promoting resource efficiency in poultry farming.

II. Materials and methods

The dietary treatments were based on compounded diets. Cattle rumen content was gathered from an abattoir in Unwana community, this was sundried for two weeks and included at varying inclusion levels: T1 = 0%; T2 = 5%; T3 = 10% and T4 = 15% . The birds were fed the experimental diets ad-libitum during the period of the three weeks for which the experiment lasted.

Experimental diets

The experimental diets were formulated and fed to the experimental birds. The compositions of the diets are shown in Table 1.

Table 1.Percentage composition of the experimental diets

Ingredient	T1(kg)	T2(kg)	T3(kg)	T4(kg)
CRC	0.00	0.27	0.54	0.81
Maize	48.97	51.66	52.51	49.52
Wheat offal	5.44	2.57	1.46	2.71
PKC	4.03	4.03	4.00	4.05
GNC	16.14	16.09	16.00	16.21
Soya bean meal	20.17	20.13	20.08	20.26
Bone meal	4.00	4.00	4.00	4.00
Salt	0.50	0.50	0.50	0.50
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated analysis				
Crude Protein (%)	21	21	21	21
Crude Fibre (%)	5.00	5.30	5.75	5.98
Crude fat (%)	4.82	4.48	4.15	3.81
Energy Kcal/kg	2990	2860	2852	2849

** To provide the following per kilogram of feed; vitA 10,000IU; vit. D3 1,500 IU; vit. E 2 mg; riboflavin 3 mg; pantothenic acid 10 mg; nicotinic acid, 2.5 mg; choline 3.5 mg; folic acid 1mg; magnesium 56 mg; lysine 1mg; iron 20 mg; zinc 50 mg; cobalt 1.25 mg.*The metabolizable energy of the test ingredient was calculated using prediction equation as reported by Pauzenga, 1985 with the formula M.E = 37 X %CP + 81.8 X %EE + 35.5 X%NFE

Note: GNC =ground nut cake. PKC=Palm Kernel Cake. CP=crude Protein.CF=Crude Fibre.CRC= cattle rumen content. T1= control diet 0% CRC. T2= 5% CRC. T3= 10% CRC. T4= 15% CRC.

Experimental birds and management

A total of eighty four (84) Ross 308 strains of four weeks old broilers with an average weight of 0.83kg were used for the experiment. The broilers were randomly assigned to four treatment groups in a completely randomized design involving dietary inclusion of T1 = 0% of cattle rumen content; T2 = 5% rumen content; T3 = 10% rumen content and T4 = 15% rumen content. Each treatment group was replicated in triplicate to obtain a total of 12 groups of 7 birds each. The chickens were randomly assigned to an experimental unit of 1m by 1m each partitioning and raised in a deep liter system of management. Feed and water were given *ad-libitum* and proper routine management practices and medications strictly adopted. The feeding trial lasted for 28 days.

Data collection and measurements

Data were collected on the growth performance; carcass and organ characteristics of finisher broiler fed dietary levels of cattle rumen content. The birds were weighed at the beginning of the experiment to ascertain their initial body weight and subsequently on weekly basis until the 28th day the experiment lasted to determine their weekly weight gain, daily weight gain and average final weight .The birds were brooded together before the commencement of the experiment; for the performance; Feed intake was recorded daily and was determined by the weigh back technique which involved obtaining the difference between quantity of feed offered and the left over the following morning. Feed conversion ratio (FCR) was calculated from the data of feed intake and weight gain as the quantity of feed taken daily per kilogramof weight gain over daily weight gain. Data was taken for the organ and carcass characteristics on the live weight, carcass weight, eviscerated weight, breast weight, thigh weight, back weight, wing weight head weight, neck weight, heart weight, gizzard weight, liver weight and the length of the small intestine. A randomly selected bird per replicate were starved of water 12 hours prior slaughtering (28th day of the experiment), these birds were weighed to get the live weight, they were slaughtered by decapitation of the neck and de feathered in a hot water after which they were weighed again to get the dressed weight, the intestines, liver, gizzard, kidney crop were evacuated while the remains were weighed to get the eviscerated weight, the remains were cut into parts such as drumsticks, wings, breast, back head and neck which were weighed on weighing scale to get their actual weight. For the organs, the electronic sensitive scale was used to weigh the liver, gizzard and heart but a measuring tape was used to measure the length of the small intestine of the experimental birds. Data collected were analyzed in a completely randomized design ANOVA. Differences among means were determined with Duncan's multiple-range test with 5% level of significance as described by Steel and Torrie (1980). The data were computed with IBM SPSS statistical 16 of 2013 software. Feed samples were assayed for their proximate composition by the method of AOAC (1990).

Table 4. **Proximate composition of cattle rumen content**

Proximate composition of experimental cattle rumen content

Accessions	MC(g/100 g)	CP (g/100 g)	CA (g/100 g)	CF(g/100 g)	F(g/100 g)	CHO(g/100 g)
CRC	4.55	15.33	4.08	2.10	0.70	73.22

CRC= cattle rumen content. MC=moisture content. CP= crude protein. CA= crude ash. CF=crude fiber. F= fat. CHO= carbohydrate

Growth performance of broiler chickens fed varying dietary levels of cattle rumen content

Data on performance of finisher broiler chickens fed varying dietary levels of cattle rumen contentis presented in table 4.

Table 4. Performance of finisher broiler chickens fed varying dietary levels of cattle rumen content

PARAMETER	T1	T2	T3	T4	SEM
Initial weight(kg)	0.40	0.40	0.40	0.40	0.04
Final weight(kg)	2.30	2.21	2.00	1.92	98.07
Average daily weight gain(kg)	0.77^{a}	0.75^{ab}	0.72^{ab}	0.68^{b}	3.50
Daily feed intake(kg)	0.29^{a}	0.21^{ab}	0.18^{ab}	0.10^{b}	1.75
Feed conversion ratio(kg)	0.38^{a}	0.28^{b}	0.25^{b}	0.15^{c}	2.55

a,b Different superscripts within each row indicate significant differences ($p < 0.05$) (n =3). Without superscript = not significant.

T1= control diet 0% cow rumen content meal. T2= 5% cow rumen content meal. T3= 10% cow rumen content meal. T4= 15% cow rumen content meal

Table 4; Carcass characteristics of finisher broilers fed dietary levels of cattle rumen content

Data on carcass characteristics of broiler chickens fed varying dietary inclusion of cow rumen content is presented in table 4.

Table 4. carcass characteristics of broiler chickens fed varying dietary inclusion of cow rumen content

Parameter	T1 0% CRC	T2 5% CRC	T310%CRC	T415%CRC	SEM
Live weight	1.733	1.733	1.633	1.533	0.432
Dressed weight	1.417	1.662	1.483	1.450	0.039
Eviscerated weight	1.467^{a}	1.250^{ab}	1.250^{ab}	1.188^{b}	0.048

Breast weight	0.350	0.350	0.400	0.267	0.036
Drumstick	0.317	0.300	0.300	0.283	0.009
Wings	0.133	0.167	0.133	0.117	0.011
Back	0.233	0.183	0.200	0.183	0.011
Shank	69.00	74.33	73.33	65.00	2.40
Head and neck	114.66	143.666	127.00	128.33	5.94

[a,b] Different superscripts within each row indicate significant differences ($p < 0.05$) (n =3). Without superscript = not significant.
T1= control diet 0% cattle rumen content. T2= 5% cattle rumen content. T3= 10% cattle rumen content. T4= 15% cattle rumen content. CRC= cattle rumen content

Table 5; Carcass characteristics of finisher broilers fed dietary levels of cattlerumen content

Data on carcass characteristics of broiler chickens fed varying dietary inclusion of cow rumen content is presented in table 5.

Parameter	T1 0% CRC	T2 5% CRC	T3 10%CRC	T4 10%CRC	SEM
Liver(g)	44.67a	35.33b	38.33ab	38.33ab	1.411
Gizzard(g)	46.67	41.33	40.33	35.00	2.205
Heart(g)	10.00	10.00	9.00	7.67	0.562
Small intestine(g)	7.20	9.83	8.33	9.93	0.596

[a,b] Different superscripts within each row indicate significant differences ($p < 0.05$) (n =3). Without superscript = not significant.
T1= control diet 0% cattle rumen content. T2= 5% cattle rumen content. T3= 10% cattle rumen content. T4= 15% cattle rumen content. CRC= cattle rumen content

III. Results and Discussion

The results of the proximate analysis,growthperformance, carcass and organ characteristics of broilers finisher fed varying dietary inclusion of cattle rumen contents as presented in tables 2,3,4 and 5 revealed that cattle rumen contentcontained appreciable quantity of nutrients higher than what is found in some agricultural by products used as feed ingredients such as maize, rice bran to mention but a few. These results are evidences that these experimented materials can help to improve the quality of chickens feed if incorporated at graded levels. This is in line with Van Soest, P. J. (1994) argument that Cattle rumen content is rich in microbial protein, vitamins, minerals, and other nutrients that can benefit livestock. The microbial population in the rumen plays a significant role in digesting fibrous plant materials, thus enhancing the nutritional value of feed for other livestock.The results of the performance of the finisher broiler fed varying dietary levels of cattle rumen content showed similar valuesfor the average daily weight gain and dailyfeed intake of the birds on 5% and 10% cattle rumen contents with the control, a non significant linear decrease was observed for the daily feed intake and daily weight gain as the level of cattle rumen content increased in the feed, this could be attributed to the unattractive appearance of the experimental diets leading to lower intake, hence, lower weight gain. The lowest significant values observed for the birds on 15% cattle rumen content justified the effects of the cattle rumen content on these parameters. Therefore, the result of this study is suggesting that cattle rumen contentare suitable for formulating diet for broiler up to 10% inclusion level without compromising the feed intake and weight gain but could negatively influence these parameters if incorporated beyond 10% in broiler diets.furthermore, the significant decrease observed for feed conversion ratio as the level of cattle rumen content increased in the feed is suggesting that the more the cattle rumen content in the experimental diet the better the diet was utilized. This is in line with the report of Johnson and Johnson (1995), whoargued that the microbial enzymes present in rumen contents can improve the digestibility of fibrous feeds when incorporated into the diets of other livestock species, thus potentially leading to better feed conversion ratios. Furthermore, Riaz and Muller (2019) also recommended in their work that cattle rumen contains numerous microbes responsible for digestion of different feed ingredient especially fibre. For the carcass and organ characteristics of finisher broilers fed dietary levels of cattle rumen content. The lower significant values for the eviscerated weight of the birds on 15% dietary level of cattle rumen content could be attributed to the lower insignificant live weight value of the bird. However, the linear decrease observed as the level of cattle rumen content increased could be an indication that inclusion of cattle rumen content in broiler diet has a reducing effect on the eviscerated weight but can still be permitted up to 10% without compromising the weight as no significant differences between the birds on 5%and 10% when compared to the control. However, anything higher than 10% inclusion of cattle rumen content could have a negative influence on the eviscerated weight of the birds. for the organ, no

significant differences were observed among all the parameters considered except for the liver in which the birds on 5% dietary inclusion of cattle rumen content had decreased value when compared to the control although these values are in the same range with Shahzad et al 2013 who argued in their work that chicken livers weigh between 0.35- 0.55kg.For the carcass and organ characteristics of finisher broilers fed dietary levels of cattle rumen content. The lower significant values for the eviscerated weight of the birds on 15% dietary level of cattle rumen content could be attributed to the lower insignificant live weight value of the bird. However, the linear decrease observed as the level of cattle rumen content increased could be an indication that inclusion of cattle rumen content in broiler diet has a reducing effect on the eviscerated weight but can still be permitted up to 10% without compromising the weight as no significant differences between the birds on 5%and 10% when compared to the control. However, anything higher than 10% inclusion of cattle rumen content could have a negative influence on the eviscerated weight of the birds. for the organ, no significant differences were observed among all the parameters considered except for the liver in which the birds on 5% dietary inclusion of cattle rumen content had decreased value when compared to the control although these values are in the same range reported by Shahzad et al 2013 who argued in their work that chicken livers weigh between 0.35- 0.55kg.

IV. Conclusion and recommendation

The finding of this study concludes that up to 10% level of cattle rumen content can be incorporated in finisher broilers diets without compromising the performance and health of broilers chickens. However, to maximize the beneficial effects of cattle rumen content such as better feed conversion in broiler production, it is recommended that the feeds should be spiced and made more attractive to encourage feed intake.

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