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Growth Performance of Broiler Birds Fed Varying Levels of Processed Rumen Contents in Their Diets

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Abstract
A study was conducted to assess growth performance of broiler chicks to the inclusion of boiled and sun-dried rumen content (BSDRC) in the diets. Two hundred (200) day old Amo chicks were randomly distributed to five treatments in a completely randomized design. Each treatment was replicated four times with 10 birds per replicate. The experimental diets were formulated to meet the nutrient requirements for broiler chicks with inclusion of BSDRC at different levels: 0, 10, 20, 30 and 40% represented by T1, T2, T3, T4, and T5 respectively. Feed and water were provided *ad-libitum*. Weekly feed intake, final body weight and weekly weight gain were recorded. Feed conversion ratio (FCR), was calculated. The experiment lasted for eight weeks. The result revealed that the weekly weight gain was ranged from 195.30g to 251.83g in the entire experimental period. Birds fed on T5 (195.30) had lowest weekly body weight gain. Final body weight was ranged from 2060.50 - 1608.50g. Birds fed on T5 (1608.50g) had lowest ($p<0.05$) final body weight. The mean weekly feed intake of birds ranged from 546.48g to 574.04g and no significant difference ($P>0.05$) observed across entire treatment groups for entire experimental period. The FCR ranged from 2.21-2.98 with the best feed conversion ratio observed in bird fed diet T2 (10%). Based on this result, it could be concluded that BSDRC meal can be included up to 10% in diet of broiler chicken without adverse effect on bodyweight gain, FCR and feed intake.

Keywords: Rumen content, abattoir wastes, animal feed, broiler chick

Introduction

Chickens form one of the most common sources of animal protein in developed countries but this is not the case in developing countries mostly due to the cost of feed which is beyond the reach of the ordinary man. Developing countries like Nigeria are suffering from inadequate supply of animal feed ingredients. The shortage and increase in prices of feed ingredients has greatly reduced the rate of expansion of poultry industry in Nigeria. In recent years, researchers tends to look for alternative and inexpensive sources of feedstuff for inclusion in animal and poultry diets. One of such from abattoir wastes includes rumen content, a potential alternative protein source. Rumen content is a substantial waste generated daily at abattoirs (Odunsi *et al*., 2003). The rumen content is a material from the rumen of cattle and other ruminant animals which is the first stomach compartment of the ruminants.

The rumen accounts for about 80% of the capacity of the adult ruminant stomach (Church, 1993). Rumen content are plant materials at various stage of digestion rich in protein and other micro-flora such as fungi, protozoa and bacteria (Esonu *et al*., 2006). Rumen content is an important source of energy and vitamins especially vitamin (B) complex. Rumen content utilization as animal feed will also alleviate and maximize the economic environmentally benign disposal of slaughter house byproducts (Esonu *et al*., 2006).

This research was conducted to assess the effect of using rumen content diets on growth performance of broiler chicks.

Materials and Methods

The research was conducted at the Teaching and Research Farm of the School of Agriculture and Agricultural Technology of the Federal University of Technology, Minna, Niger State, Nigeria. Minna lies within latitude $9^{0}30^{1}$, North and longitude $6^{0}33^{1}$, East. The annual rainfall ranges between 110mm-1600mm and a mean temperature of 21^{0}C and 36.5^{0}C (Usman 2011)**.** Two hundred (200) Day old experimental broiler chicks (Amo) were purchased from a commercial poultry farm. On arrival the birds were weighed and distributed randomly to five treatments (40 birds/treatment) with four replicates (10 birds/replicate) in a completely randomized design. The bird in each pen (10 birds/pen) had continuous access to water and the experimental diets were fed *ad-libitum*. The birds were raised on the floor with 1.25 × 1.25 meter spacing for the floor and 2.5 ×5.0 meter height to allow birds to have easy access to feed and water. The house was electrically heated using 200 watt bulbs per pen.

The rumen contents were collect from the Bosso abattoir, Minna, Niger state. The rumen was divided with the aid of a sharp knife and the contents emptied into a big metal vat. The metal vat containing the rumen content was placed on fire and boiled for 30 minutes. The proximate composition of boiled and sun-dried rumen content is shown in table 1.

Table 1: Composition of the experimental diets for starter and finisher broiler chickens at varying level of inclusion of BSDRC (%)

	Starter Ration					Finisher Ration				
Ingredients	0(%) T1	10(%) T2	20(%) T3	30(%) T4	40(%) T5	0(%) T1	10(%) T2	20(%) T3	30(%) T4	40(%) T5
Maize	43.00	40.00	40.50	35.00	30.00	50.00	48.00	47.50	47.00	44.00
GNC	24.50	23.80	14.80	12.00	8.80	20.50	17.00	14.00	10.00	7.00
SBM	9.45	8.00	7.25	6.80	6.00	9.45	8.80	7.25	5.00	3.30
Wheat bran	13.50	10.00	10.00	10.00	10.00	10.50	7.00	4.80	2.74	3.00
BSDRC	0.00	10.00	20.00	30.00	40.00	0.00	10.00	20.00	30.00	40.00
Fish meal	4.20	3.50	3.20	2.70	2.20	3.20	2.70	2.20	2.50	1.70
Rice offal	4.59	3.94	3.49	2.74	2.24	5.59	5.74	3.49	2.00	2.23
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Lysine	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Total	100	100	100	100	100	100	100	100	100	100
Nutrient analysis										
Crude protein	23.50	23.50	23.41	23.34	23.21	21.05	21.01	21.00	21.00	21.00
M.E(Kcal/Kg)	2801	2801	2800	2800	2800.	3000	3000	3000	3000	3000
Crude fibre	3.40	3.23	4.01	4.00	3.91	3.45	5.01	5.01	5.10	5.41
Calcium	1.0	1.01	1.0	0.9	1.1	1.10	1.00	1.00	0.99	1.19
Phosphorus	0.8	0.7	0.9	0.7	0.8	0.84	0.70	0.60	0.80	0.70

*GNC= Groundnut Cake, SBM= Soybean Meal, BSDRC = Boiled and Sun-Dried Rumen Content.**To provide the following per kg of diet; Vit A, 10,000iu; Vit D2, 1,500iu; Vit E, 3iu; Vit K, 2mg; Riboflavin, 3mg; Vitamin B12, 0.08mg; Folic acid, 4mg; Mn, 8mg; Zn, 0.5mg; Iodine, 1.0mg; Co, 1.2mg; Cu, 10mg; Fe. 20mg

The boiled rumen contents were spread on a clean plastic sheet for sun drying for 4 days. The boiled and sundried test material was milled using a hammer mill to produce finely boiled and sun dried rumen content meal. Samples of the boiled and sun dried rumen content was taken for proximate analysis using standard methods (AOAC, 2000). Experimental diets were formulated according to nutrient specifications of the standards published by National Research Council (NRC, 1994) with five levels of dried rumen contents; 0 %, 10 %, 20%, 30% and 40% and will be represented by T1, T2, T3, T4, and T5 respectively. During the first week of age, chicks were fed the control diet to allow them adapt to the experimental diet then received the experimental diets till the end of the experimentThe experiment lasted for eight weeks (56 days). Chicks were weighed on the first day of the experiment (initial weight), and then weekly weighing was systematic until the end of the experiment. Feed intakes were determined on daily basis by subtracting feed left over from feed supplied. Body weight gain, feed intake and FCR were calculated.

Data on feed intake, weight gain and FCR parameters were subjected to Analysis of Variance (ANOVA) to establish significant differences and different means was separated using Duncan's multiple Range test, contained in SPSS (2012).

Results and Discussion

The proximate composition of boiled and sun-dried rumen content (BSDRC) is shown in table 2. It contained9.05% moisture content, 24.15% crude protein, 35.33% crude fibre, 1.50% fat content, 12.00 % Ash content, 17.97% NFE. The calcium was observed to be 1.10 g/kg, phosphorus was observed to 1.02g/kg and the metabolized energy was observed to be 1819.8 Kcal/kg. The basic nutrient that cannot be compromised in the choice of ingredients for feed formulation and preparation is protein (Zeitler *et al.*, 1984).The high crude protein value of BSDRC suggests its utilization as a protein supplement in diets of broilers chicks. The calculated chemical composition of the diet is shown in table 1.

Table 2: Proximate composition of boiled and sun-dried rumen contents

MC	CP	CF	FC	AC	NFE	Ca	P	ME/kcal/kg
9.05	24.05	35.33	1.50	12.00	17.97	1.00	1.02	1819.8

MC = Moisture content, CP= Crude protein, FC= Fat content CF= Crude fibre, AC= Ash content, NFE= Nitrogen free extract, ME = Metabolizeable energy, Ca= calcium, P= phosphorus.

The crude fibre value of the diets was observed to increase as dietary inclusion of BSDRC increased. In contrast, the crude protein value of the diets was observed to decrease as dietary inclusion of BSDRC increased. The performance of broiler

starter, finisher and overall performance for the entire experimental period of chicks fed varying inclusion levels of BSDRC were shown in table 3. The results showed that weekly body weight gain decreased significantly ($p< 0.05$) with increase in the level of BSDRC. The weight gain of birds on control diet (T1) was significantly ($p<0.05$) higher at starter phase compared to T5 (40%). However it was comparable to birds fed 10% (T2), 20% (T3) and 30% (T4). In contrast, there was no significant ($p>0.05$) difference across the treatments in weekly body weight gain at finisher phase and at the entire experimental period. Weight gain seems to decrease with decrease in BSDRC. This could be attributed to poor digestion and utilization of protein Yitbarek *et al.* (2016).The best feed conversion ratio was observed in birds fed 10% inclusion level of test materials at finisher phase and the entire experimental period (1-56 days). However, best feed conversion ratio at starter phase was observed in broiler birds fed 0%inclusion levels of test material. The poor performance observed in the final body weight gain of broiler chicken fed with test materials at starter phase could be due to young chicks having a less developed gastro intestinal tract to handle the fibre contents of the diets (Esonu *et al*., 2006).

Table 3: Performance of broiler chicken fed varying levels of inclusion of BSDRC at starterphase (1-28 days), finisher Phase (29-56 days) and the entire experimental period (1 –56days)

Parameter	T1 0% BSDRC	T2 10 % BSDRC	T3 20 % BSDRC	T4 30 % BSDRC	T5 40% BSDRC	Std. Error
Starter phase						
Initial body weight (g/bird)	46.20	46.20	46.20	46.20	46.20	0.00
Average final weight(g/bird)	662.12^{a}	633.36^{b}	611.60^{b}	502.84^{c}	430.85^{c}	19.2
Average weekly feed intake (g/bird)	304.75	303.69	306.69	299.10	294.06	18.27
AWBWG (g/bird)	153.98^{a}	146.79^{ab}	141.35^{ab}	114.16^{ab}	96.16^{b}	0.61
FCR	1.98^{a}	2.07^{a}	2.17^{a}	2.62^{b}	3.05^{c}	0.20
Finisher phase						
Initial Body weight (g/bird)	662.12^{a}	633.36^{b}	611.60^{b}	502.84^{c}	430.85^{c}	19.20
Average final weight (g/bird)	1331.76^{a}	1381.24^{a}	1184.50^{ab}	1221.20^{ab}	1131.52^{b}	47.04
AWBWG (g/bird)	332.94	345.31	296.13	305.30	282.88	15.19
Average weekly feed intake (g/bird)	791.26	765.31	838.15	806.14	808.03	18.12
FCR	2.37^{a}	2.21^{a}	2.83^{b}	2.64^{b}	2.86^{b}	0.25
Entire Experimental Period						
Total feed intake (g/bird)	4371.84	4267.84	4592.32	4420.96	4408.40	188.73
Average Weekly feed intake (g/bird)	546.48	533.48	574.04	552.62	551.05	23.59
AWBWG (g/bird)	249.24	251.83	247.01	215.51	195.30	11.38
Total body weight gain (g/bird)	1993.89^{a}	2014.60^{a}	1976.10^{b}	1724.05^{b}	1562.37^{c}	42.71
Final body weight (g/bird)	2040.05^{a}	2060.50^{a}	1842.25^{b}	1770.25^{b}	1608.50^{c}	42.71
FCR	2.24^{a}	2.21^{a}	2.68^{b}	2.69^{b}	2.98^{c}	0.14

^{abc}Means with a different superscript in a row are significantly different ($p< 0.05$).AWBWG: Average weekly body weight gain

Conclusion and Recommendations

The inclusion of boiled and sun-dried rumen content up to 10 % in broiler chicken diet has better fed conversion ratio and weight gain. This suggests that BSDRC at 10% level is effective in improving performance since it has no deleterious effects on the performance of the birds.

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