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Effect of Dried Rumen Content with and Without Cellulase in Diet on Carcass Quality of Broiler Chickens

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Abstract: The objective of the experiment was to assess the responses of broiler chicks to the inclusion of dried rumen content with and without cellulase on broiler diet. A total of 90 broiler chickens were used in this study. Broilers were randomly allotted to five dietary treatment groups and each treatment group was equally divided into three replicates. The dietary treatments were based diet (BD), 90% BD+10% Rumen Content (RC), 80% BD+20% RC, 90% BD+10% Rumen Content with Cellulase (RCC) (RC+0.5 g/kg cellulase), 80% BD+20% RCC, as R0, R1, R2, R3 and R4, respectively. The experiment terminated after 4 weeks at the age of 7 weeks, during which, feed intake, carcass yield, abdominal fat and blood cholesterol were measured. All experimental data were subjected to the analysis of variance test followed by orthogonal contrast test. Results showed that the daily feed intake of BD was significantly higher than RC and the RC was significantly higher than RCC, but no significant difference was observed between RCC 10 and 20%. Daily crude fibre intake of BD was significantly lower than RCC and RCC was significantly lower than RC. Carcass yield of BC was significantly higher than RC and RCC was significantly higher than RC and carcass yield was higher than RCC. Abdominal fat weight of RC was significantly lower than BD and RCC and the best abdominal fat weight was recorded in RC treatment. It can be concluded that rumen content without cellulase in diet could be acceptable for abdominal fat weight and rumen content incubated with cellulase could be acceptable up to 20% levels in broiler diets for carcass yield and blood cholesterol.

Key words: Broiler, carcass, cellulase, rumen content

INTRODUCTION

Rumen content is a material from the rumen of cattle which is the first stomach compartment of the ruminants. It is account for about 80% of the capacity of the adult ruminant stomach (Church, 1993). The bulk digestion of the rumen content is an important source of energy, protein and vitamins especially vitamin B complex (Adeniji and Jimoh, 2007). Agbabiaka *et al.* (2011) stated that rumen digesta is the partially digested forage mainly found in the rumen of ruminant animals and fairly rich in crude protein (18.52%). These waste materials, if properly treated can be useful for animals. The feedstuff is relatively cheap and it is a waste constituting disposal problem at the abattoir and it is locally available. Oladunjoye and Ojebiyi (2010) stated that it is cheaper and locally available alternative agro-by products, especially those that have no nutritional value to mankind. In order to get the dried rumen contents, rumen contents are processed and solids are mechanically separated from the liquid, retaining the solids as animal feed. The dried rumen digesta obtained in this way not only serves as a feed nutrient, but also its recycling reduces disposal and environmental pollution problem (Swan, 1992). The dried rumen contents contain high fiber which tends to increase the total fiber content of the diet (Khan *et al.*, 2014).

Poultry, like other monogastric animals, have little or no ability to digest high fibrous materials and this is one of the major problems in their utilization of agricultural wastes. Chickens do not posses enzymes like cellulase, hemicellulase, xylanase and phytase to digest components of cell wall of plant. It is therefore difficult and uneconomical to substitute completely. This rumen content is a fibrous feedstuff with 14.48% crude fibre (Adeniji and Jimoh, 2007). As Makinde *et al.* (2008) reported that dietary sun-dried rumen content-blood meal up to 10% was beneficial for growth performance and that total replacement of fishmeal was possible in broiler diets. Moreover, Has *et al.* (2013) stated that a decline in final body weight and digestibility of nutrients as long the increased use of mulberry leaves in broiler's feed, but rumen liquor fermentation treatments proven an improving digestibility of mulberry leave than unfermented treatments. Colette *et al.* (2013) reported that dried rumen content and castor oil seed cake diets were served to broiler birds in an attempt to determine their effects on haematological indices, serum biochemistry and organoleptic properties of the birds.

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Chicken meat is an important segment of the consumption structure of various meat types as it is one of the favorite meat types. In addition, it is quick and easy to prepare, healthy, safe and nourishing (Vukasovic, 2011). Consumers do not cherish tissues of broilers with excessive lipid deposits (Alvarenga *et al*., 2011). In fact, they prefer meat with less fat (Thiruvenkadan *et al*., 2011). Consequently, poultry farmers and researchers have been trying several alternatives to enhance feed quality on meat production.

Keeping in view the importance of rumen contents present study was planned to study the feasibility of using rumen content in broiler feed. The main objectives of the present study was to study on diets having varying levels of rumen contents with and without cellulase on carcass quality in broilers.

MATERIALS AND METHODS

Preparation of rumen content: Fresh rumen content obtained from the rumen of slaughtered cattle was processed with filter and solids are mechanically separated from the liquid, then the solids were sun-dried to constant weight for 3-5 days. Part of the solids then was ground to fine powder using mortar and pestle, then milled and mixed with cellulase to incubate on 48 hours. Chemical composition of rumen content and feedstuff were determined using standard procedures of AOAC (1990) (Table 1 and 2).

Birds and feed: A total of 90 broiler chickens finisher CP 707 were used for this study which lasted for 4 weeks at the age of 7 weeks. The chicks were randomly allocated to five dietary treatment groups and each treatments had three replicates of six experimental birds. The dietary treatments were based diet (BD), 90% BD+10% RC, 80% BD+20% RC, 90% BD+10% RCC (RC+0.5 g/kg cellulase), 80% BD+20% RCC (RC+0.5 g/kg cellulase), as R0, R1, R2, R3 and R4 respectively. Based diet contain 55% yellow corn, 35% commercial diet, 9.5% rice bran and 0.5% Top Mix. Throughout the experiment, the birds were allowed to consume feed and water *ad libitum* and feed intake, carcass yield, abdominal fat and blood cholesterol were measured. Survivability was 100% for all of the treatments. On day 29 of the experiment, one representative bird from each pen was conventionally sacrificed by cervical dislocation technique, as described in the Report of the AVMA Panel on Euthanasia (AVMA, 2001) and its carcass parameters (ready to cook) including dressing percentage and abdominal fat were determined.

Statistical analysis: The data were subjected to analyze for a variance technique using completely randomized design (CRD) that was employed in one-way analysis of variance. The data were subjected to analyze for a variance technique using completely randomized design (CRD). All experimental data were subjected to the analysis of Variance test (ANOVA) followed by orthogonal contrast test (Snedecor and Cochran, 1967). Software package Genstat 12.2. was used for statistical calculation.

RESULTS AND DISCUSSION

The effect of the dietary treatments on carcass quality of broiler chickens is as shown in Table 3. Results showed that the daily feed intake of BD was significantly ($p<0.05$) higher than RC and the RC was significantly higher than RCC, but no significant difference was observed between RCC 10 and 20%. Moreover, daily crude fibre intake of BD was significantly lower than RCC and RCC was significantly lower than RC. Carcass yield of BC was significantly ($p<0.05$) higher than RC and RCC was significantly higher than RC and carcass yield were highest in treatment RCC. Carcass yields were higher ($p<0.05$) for all RCC diets than the RC diets. Abdominal fat weight of RC was significantly lower than BD and RCC and the best abdominal fat weight was recorded in RC treatment. Mortality was not affected by dietary treatments.

The gradual decrease in feed intake was observed when the level of rumen content in the diets was increased. This result was in line with Elfaki *et al.* (2014), who reported that the dried rumen content had no adverse effect on performance and biochemical value of plasma in broiler chicks.

Therefore, it can be used up to 10% as a cheap source of energy and protein with reduced feed cost and environmental pollution. The decreasing of feed intake may be attributed to an increase in the fiber content of the feed. Fiber creates bulkiness of the feed in the gut and this reduces the feed consumption of the birds. However, birds consume to satisfy their energy requirements and the presence of synthetic enzymes resulting in the breakdown of fiber may be responsible for the decrease in feed intake observed in this study.

Contrary results were found by Okorie (2005) and Esonu *et al.* (2006), who reported that there was more consumption of feed containing rumen content than control. This difference in feed intake may be attributed to the improvement in the value of rumen content by the addition of enzyme which increases the protein content of the mixture. Also, Adeniji and Oyeleke (2008) reported that based on the comparable feed to gain ratio, the 20% RC diet is recommended and 5% grit level gave a better feed to gain ratio higher profitability and better protein retention. Hence 20% RC with 5% grit inclusion is recommended for diets of pullet chicks.

Colette *et al.* (2013) reported that carcass yield from broiler chickens fed dried rumen content was better than those fed dried rumen content mixture at 25% castor oil seed cake. However, Odunsi (2003) reported that bovine blood-rumen digesta meal in the form fed did not fully

Table 1: Proximate analysis of the ingredients

	Nutrients (%)						
Ingredients	CP	CF	Fat	Ash	Ca	P	GE (Kcal/kg)
Rumen contents (RC)	6.60	40.4	1.00	12.2	0.22	0.32	3932
Silage (RC+Cellulase)	16.4	33.7	2.08	15.6	0.14	0.20	3935
Corn	8.60	2.67	2.0	1.70	0.10	0.20	4155
Rice bran	12.0	30.4	3.67	14.2	0.04	0.04	3863
Commercial diet	40.0	6.00	7.00	12.0	2.50	1.20	3625

Table 2: Calculated analysis of the diets

Nutrients	R0	R1	R2	R3	R4
Crude protein (%)	19.9	18.5	17.2	19.5	19.2
Crude fibre (%)	6.46	9.85	13.2	9.17	11.9
Fat (%)	3.89	3.59	3.30	3.70	3.53
Ash (%)	6.47	7.04	7.61	7.38	8.96
Ca (%)	0.92	0.84	0.77	0.83	0.76
P (%)	0.53	0.51	0.48	0.55	0.46
GE (Kcal/kg)	3921	3922	3923	3922	3924

Table 3: Effect of rumen content with and without cellulase on carcass quality of broilers

	Treatments					Contrast			
Variables	R0	R1	R2	R3	R4	C1	C2	C3	C4
Feed intake (g/h/d)	127	122	120	122	121	*	*	*	ns
CF intake (g/h/d)	8.22	12.0	15.9	11.2	14.4	*	*	*	*
Carcass weight (kg)	1.55	1.43	1.15	1.73	1.62	*	*	*	*
Abdominal fat weight (g)	37.2	24.5	17.1	31.2	29.3	*	*	*	*
Blood cholesterol (mg/100 ml)	130	98	86	120	103	*	*	*	*

CF: Crude fibre, g/h/d: gram/head/day, *: Significantly difference ($p<0.05$), ns: Non significant difference
C1: R0 vs., R1+R2+R3+R4, C2: R0 vs., R3+R4, C3: R1+R3 vs., R2+R4, C4: R1+R2 vs., R3+R4

support productive performance of layers when compared to a diet without it. These results emphasize the quality of RCC as a good substitute to based diet of broiler for carcass yield.

The differences in dressed yield of broilers could be due to different diet, kind and level of enzyme used. This could be due to lower deposition of fat.

Deposits of fat in the abdominal region of the broiler are considered a rumen content with and without enzyme. Osei and Oduro (2000) reported that there were no differences in abdominal fat percentage due to enzyme treatment. These results emphasize the quality of RC as a good substitute to based diet of broiler for abdominal fat weight.

Conclusion: It can be concluded that rumen content without cellulase in diet could be acceptable for abdominal fat weight and rumen content incubated with cellulase could be acceptable up to 20% levels in broiler diets for carcass yield and blood cholesterol.

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