

Effects of Dietary Grit Fed on the Utilization of Rumen Content by Pullet Chicks

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Abstract: Two hundred and forty harco pullet chicks were fed eight experimental diets which lasted for 56 days. The study was design to determine the effects of grits inclusion on the utilization of rumen content by pullet chicks. There were eight (8) dietary treatments, in which rumen content (RC) was included at graded levels of 0,10,15 and 20% and two levels of grit (0 and 5%) that is 4 by 2 factorial experiment. The feed intake by pullet chicks on all the RC diets were comparable ($P>0.05$) and significantly higher ($P<0.05$) than the intake by chicks on the control diet. There was reduced ($P<0.05$) feed intake with the 5% grit inclusion in feed. Body weight gain kept decreasing ($P<0.05$) as the level of RC increased in the diet. Feed to gain ratio were comparable for chicks fed on the RC diets, although the chicks fed the control had significantly better ($P<0.05$) feed to gain ratio. Chicks on the 5% grit diets had better ($P<0.05$) feed to gain ratio that those on the 0% grit diets. Profitability increased as the level of RC increased in the diets with chicks fed the 20% RC diets giving a profitability of 40.19%, also the chicks fed the 5% grit tended to give a better profitability of 40.03%. The protein retention value for chicks decreased ($P<0.05$) as the level of RC increased in the diets. The chicks fed the 5% grit diets had better ($P<0.05$) protein retention value.

Key words: Grit, Rumen content, pullet chicks, profitability, utilization

INTRODUCTION

The world today is suffering from a serious shortage of livestock feed ingredients such as wheat, corn soyabean e.t.c., because of the rapid increase in human population and the competition for this feedstuff between the increased human population and livestock. The increase in price of feed ingredient in developing countries has greatly reduced the rate of expansion of the poultry industry. In order to arrest this trend, emphasis has been directed towards the use of economical and efficient feeds stuffs such as abattoir wastes. This allows for saving in the feed cost without reducing the nutritive quality of the ration.

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^[7]. It has a repulsive and inherent odour when processed into feedstuff. The bulk digestion of the rumen content is an important source of energy, protein and vitamins especially vitamin B complex^[8]. The feedstuff is relatively cheap, it's a waste constituting disposal problem at the abattoir and it is locally available.

Grits are hard bits of stones, sand and small particles utilized by birds in their gizzard to aid abrasion^[5]. Grits can be classified into soluble and insoluble grits. The soluble grits include limestone and

oyster shell, which are easily dissolved in the gizzard, they also serve as source of minerals and calcium. The insoluble grits include silica, mica, they are non digestible and are retained in the gizzard. Atteh^[5] reported that a bird can tolerate about 5% grits in their diet and it also improves the efficiency of feed utilization by the birds. This study was aimed at determining the level of rumen content that pullet chick can tolerate when grit is included in their diet and also to determine the effect of grit on the performance of pullet chicks. The rumen content is a fibrous feedstuff with 14.48% crude fibre. The experiment was conducted with the assumption that the feeding of grits will help degrade the crude fibre in rumen content and improve its utilization by pullet chicks.

MATERIALS AND METHODS

The rumen content was collected at the abattoir at slaughtering time immediately the visceral was split open. The rumen content was boiled in a drum for about 2½hours hours with intermittent stirring to prevent burning. It was then sun dried until the moisture content was below 10% and later ground. On analysis, the fed rumen content contained 10.90% crude protein, 3.01% crude fat, 14.48% crude fibre and 14.5% ash.

A total of 240 day old harco pullet chicks were used for this study which lasted for 56 days. The chicks were randomly allocated to eight dietary treatments. Each treatment had three replicates of ten experimental birds. The experimental birds were fed four levels of rumen content (0, 10, 15 and 20%) and two levels of grit (0 and 5%) as shown in table 1. The experimental diets and water were given *ad libitum* throughout the experimental period. A 4 by 2 factorial design was used i.e., 4 levels of rumen content by 2 levels of grit.

The chicks were given antistress and glucose for the 1st 3 day, followed by coccidiostat on the 10th day for 3 consecutive days. Vaccines administered are gumboro on the 14th and 35th days, lasota (Newcastle disease) on the 21st day, kumorov on the 42nd day and fowl pox on the 49th day.

Records of feed intake and weight gain were kept; feed to gain ratio, cost of feed, cost of rearing the bird, selling price, gross profit and profitability were calculated. At the seventh week of the experiment, nutrient retention trial was conducted using the total fecal collection method. All proximate analysis was conducted following the procedure described by A.O.A.C.^[3].

Statistical package appropriate for 4 x 2 factorial experimental design, where significant means were compared using the Duncan's multiple range test^[12].

RESULTS AND DISCUSSION

Results: The growth performance characteristics and economic implication of the pullet chicks fed rumen content with or without grit inclusion are presented in table 2.

Throughout the eight weeks experimental period, only 3 birds died with one each occurring in diet 2, 4 and 6. The feed intake values for the chicks on the 10, 15 and 20% level of RC diets had comparable ($P>0.05$) feed intake values of 39.66, 38.42 and 38.06g respectively. Chicks fed on the 5% grit level had lower ($P<0.05$) feed intake value when compared with chicks on the 0% grit level (37.00 and 39.66g respectively).

The birds fed on the control diet had a weight gain of 6.00g which was significantly higher ($P<0.05$) than the weight gained by chicks on other experimental diets; although comparable with the weight gained by the chicks on the 10% RC diet.

Pullets on the 20% RC diet had the poorest ($P>0.05$) feed to gain ratio in this study. Values for chicks on other RC diets are very close with the exception of birds on the control diet (6.00) which was significantly ($P<0.05$) better.

A reduction in the price of feed was observed with the increase in the levels of RC in the test diets.

The 20% RC diet had N36.65/kg as the cost of feed. The total cost of raising the pullet from day old to 8 weeks also kept reducing as the RC level increased in the diet.

There were saving in the cost of feed as the inclusion level of grit increased in the diets ranging from N38.19/kg for 0% grit to N37.39/kg in the 5% level of grit diet.

The result of the nutrient retention of pullet chick fed rumen content with or without grit is presented in table 3: The pullet on the 20% had the lowest ($P<0.05$) protein retained (68.87%) which is comparable with 70.80% retained by chicks on the 15% RC diet. The chicks on the 10% RC diet had the highest ($P>0.05$) amount protein being retained which is comparable with that retained by chicks on the control diet.

The crude fat retention were comparable ($P>0.05$) for all the levels of RC fed. But the grit inclusion manifested in a higher fat retention value for chicks fed the 5% grit.

The chicks fed the control diet had significantly highest ($P>0.05$) fibre retention value of 37.77% which was only comparable to fibre retained by the chicks fed the 15 and 20% RC diet which had 30.98 and 31.41% retention respectively. There was significant ($P>0.05$) effect of grit inclusion on fibre retention. There was no interaction between the levels of RC and the grits.

Discussion: The gradual increase in feed consumption with increase in the level of rumen content in the diet may be due to the fact that the pullet chicks consumed more feed to meet their energy requirement^[4,1,10]. The grit abrasion of the feed particles also breaks the fibrous materials into small bits for enzymatic action. Result of feed intake that showed that 5% inclusion level had lower feed intake of 37.00g implies that the 5% grit fed made more nutrients available to the pullets hence they ate less and their nutrient requirement was met with less feed consumed. Atteh and Dare^[6] reported that increasing grit level allowed for efficient utilization of high rice bran (10%) diet by broiler finisher.

In the weight gain, there was a gradual decrease in weight gain as the level of rumen content increased. This can be compared with the use of brewer's dried grains in which when included in the broiler diets as its level of inclusion in the experimental diet increased, weight gain reduced^[5].

The feed to gain ratio of the birds improved with the inclusion of 5% grit, which implies that the grit inclusion in diets will help chicks tolerate more of RC, and this will result in feed cost savings as grits are obtained free and RC is cheap.

Table 1: Composition of experimental diet (kg/100kg)

Ingredients	1	2	3	4	5	6	7	8
Maize	45	45	45	45	45	45	44	39
Corn bran	20.15	15.15	10.15	5.15	5.15	6.15	2.15	1.15
Rumen content	0	0	0	0	0	0	0	0
Grits	0	5	0	5	0	5	0	5
Soya bean meal	10	10	10	10	10	10	10	10
Groundnut cake	19	19	19	19	19	18	18	19
Fish meal	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Limestone	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Bone meal	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Methionine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
*Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total	100	100	100	100	100	100	100	100
	Proximate composition (analyzed values)							
Dry matter (%)	97.6	90.24	94.70	95.00	93.6	92.6	95.00	90.11
Crude protein (%)	24.70	22.53	21.66	21.40	20.72	20.56	20.78	19.68
Ether extract (%)	3.40	3.55	4.15	4.07	2.80	3.51	3.33	3.18
Crude fibre (%)	5.05	4.60	5.60	6.70	7.05	6.11	7.25	6.22
Ash %	10.35	9.35	10.50	9.75	11.71	8.72	9.20	9.53
M.E. (kcal/kg)	2863.55	2738.55	2613.3	2488.4	2488.3	2487.15	2352.7	2182.51

*premix used contained the following per kg: Vit A = 400,000IU
 vitD₃ = 800,00IU, vitE=9200mg, vitk₃ = 800mg, vit B₁ = 720mg,
 vitB₂ = 2000mg, vitB₆=1,200mg, vit B₁₂ =6400mg, Niacin = 11,000mg,
 pentatonic acid = 3000mg, folic acid = 30mg, Biotin = 24mg,
 choline chloride = 120,000mg, manganese = 16000mg, iron = 8000mg,
 zinc = 12,000mg, copper = 1,200mg, iodine = 400mg, cobalt = 80mg
 selenium = 80mg, Antioxidant = 500mg.

Table 2: Growth performance characteristics and economic implications of pullet chicks fed rumen content with or without grit inclusion.

Parameters	Feed Intake	Weight Gain	Feed to Gain	Feed Cost/N	Rearing Cost (N)*	Selling Price (N)	Gross Profit (N)	Profitability %
	Level of RC (%)							
0	36.00 ^b 39.66 ^a	6.00 ^b 5.86 ^{ab}	6.00 ^b 6.77 ^a	38.73 37.93	297.96 258.43	430	132.04 171.57	30.71 39.90
15	38.42 ^a	5.72 ^a	6.72 ^a	37.85	258.35	430	171.65	39.92
20	3806 ^a	5.61 ^a	6.78 ^a	36.65	257.15	430	172.85	40.19
SEM	1.27	0.21	0.79					
	Level of grit (%)							
0	39.66 ^a	6.42 ^a	6.18 ^a	38.19	258.69	430	171.31	39.84
5	37.00 ^b	6.46 NS	5.73 ^b NS	37.39	257.89	430	172.11	40.03
SEM	0	0.22	0.56					
Interaction btw RC and Grit	NS	NS	NS					

Means in the same column follow by the same superscript letter are not significantly different (P>0.05).

*cost of feed + cost of drug + labour + cost of vaccines + cost of day old chicks

N128 = \$1 as at May 2007 when the experiment was conducted.

Table 3: Effect of feeding rumen content with or without grit inclusion on nutrient retention by pullet chicks.

Parameter	Crude protein (%)	Crude fat (%)	Crude fibre %
	Level of RC (%)		
0	74.45 ^a	79.47	37.88 ^a
10	75.73 ^a	80.99	25.98 ^b
15	70.80 ^b	79.42	30.98 ^{ab}
20	68.87 ^b	81.32	
NS	31.41 ^{ab}		
SEM	3.97	2.74	4.08
	Level of grit (%)		
0	68.66 ^b	76.18 ^b	28.88 ^b
5	76.23 ^a	84.42 ^a	34.24 ^a
SEM	2.81	1.94	5.74
Interaction between RC and grits	NS	NS	NS

*a, b Means in the same column followed by the same superscript letter are not significantly different (P>0.05).

The reduction in the price of feed with increase in the level of rumen content in the diet was as a result of cheap price per kg of the RC which is the test feedstuff. The rumen content can be prepared at a total cost of N9/kg which is far cheaper compared with prices of most conventional protein supplement available^[2].

Fibre source have negative effect on protein and amino acids digestibility when dietary fiber contribute a significant amount of dietary protein, the effect on nutrient digestibility is high. The fibrous feedstuffs are known to allow constant passage of materials through the gut of an animal, there by reducing adsorption of nutrient in the body of the animal. The grit inclusion had significant effect on the protein retention with chicks on 20% RC diets retaining as high as 68.87% protein and significantly better protein retention on the 5% grit diets than the 0% grit diets. This implies that the simple inclusion of grit at no extra cost to the feed will give a better crude protein, fat and fibre retention resulting in better overall performance of the birds.

Based on the comparable feed to gain ratio, better profitability, and comparable crude protein retention, the 20% RC diet is recommended, similarly the 5% grit level gave a better feed to gain ratio higher profitability and better protein retention. Hence 20% RC with 5% grit inclusion is recommending for diets of pullet chicks.

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