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Effects of feeding graded levels of rumen content meal on the performance of growing snails

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ABSTRACT

A total of 150 growing snails were used for this experiment that lasted for a period of ten weeks. The study was designed to determine the effect of feeding growing snails on rumen content meal (R C M). There were five dietary treatments in which rumen content was include at graded levels of 0, 7.5,15, 22.5 and 30%.

The snails fed on the R C M diet had a comparable body weight (P>0.05) which "tended" to be higher than the snails fed the control diet. The feed intake were highly comparable (P>0.05) for snails on all the experimental diet, but the snails fed on the control diet "seemed" to have the lowest feed intake value. The feed to gain ratio value were comparable throughout, but the snails fed 15 and 30% R C M diet both had the lowest feed to gain ratio while the highest were recorded on the 22% R C M diet. The shell length gain showed significant effect (P<0.05), but the best value were recorded at control diet 0 and 7.5% inclusion of R C M while 15 and 30% had the least value on shell length gain. The shell thickness were comparable (P>0.05) throughout, but it was noted that the best value were recorded at 30% level of inclusion. The profitability increased as the level of R C M increased in the diet with snails fed 30% R C M diet giving a profitability of 47.7%.

KEYWORDS

Snails;
Rumen content;
Growth performance;
Cost reduction.

INTRODUCTION

The rapid growth of human population in Nigeria has not only led to high demand for animal protein, but has called for increased efficiency in feed stuff utilization by livestock Osho et. al.[16] emphasized the need for improved feeding management and productive performance of livestock as essential to overcome Nigerian animal protein insufficiency. There is the need to improve snail production in Nigeria so as to increase the supply of animal protein due to the high cost of poultry, beef and other domestic animals. The animal protein shortage in Nigerian cannot be solved by large animal with their low production cycle. Therefore animals such as snail with a very short gestation and productive cycle can help solve this protein shortage problem. Recently there has been increased awareness in snail production to the development of nation's economy and the development of nutritional status of its consumers[2].

The potential of snail, as an animal protein source

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has been emphasized[14]. Snail has been reported to be rich in protein 12-18% and wet basis[7] 52-53% on dry basis[9] and Iron[7,20]. Snail meat is low in fat and is reported to have some medical properties.

Generally, feed accounts for the largest percentage of production cost in snail farming, this is as a result of increase in price of conventional feed stuffs used in livestock formulation. Protein concentrate are very expensive with their prices as high as N125, N95 and N500/kg for soya beans (42% CP), groundnut cake (45% CP) and fish meal (72% CP) respectively (July, 2011 price). Conventional feed concentrate take about 70-75% total cost of production and this has definitely led to unprofitability in livestock production[10].

Conventional protein, the major source of body building concentrate used in livestock feed are becoming too exorbitant infact they are scarce in the country due to competition between human beings, confectionery industries and animal. This deficit may be due to the fact that human population and livestock are increasing more rapidly than food production, it could also be due to reduced production capacity of the agricultural sector.

The abattoir by product is a promising feed stuff particularly when prices of conventional protein concentrates are very high and scarce. Sonaiya[18], reported that the animal by-product supply protein, amino acid and mineral.

The rumen content which is obtained from the abattoir as waste from ruminant animal is then used in formulation of snail feed. This study was design to determine the level of Rumen Content inclusion on snail feed which will give optimum performance.

MATERIALS AND METHODS

Rumen content was collected fresh from the abattoir immediately the visceral of the bovine was opened; it was boiled in a large aluminum locally made pot for about three hours with constant stirring to prevent burning and to kill microbes present in the rumen content. After boiling it was sun-dried to the moisture content of about 12%. The rumen content was analyzed according to A.O.A.C[1] and result showed it contained Crude protein 17.30%, crude fibre 24.58%, ether extract 2.81%, nitrogen free extract 40.82% and Ash 7.49%. This was used in the formulation of the experimental diets (TABLE 1).

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

Ingredient	1	2	3	4	5
Corn bran	28	20.75	14.25	6.75	0
Rumen content	0	7.5	15	22.5	30
Maize	30	30	30	30	30
Soya	12.25	13	12	12	12.25
Groundnut cake	14	13	13	13	12
Blood meal	5	5	5	5	5
Fish meal	1.5	1.5	1.5	1.5	1.5
Bone meal	1.5	1.5	1.5	1.5	1.5
Limestone	7	7	7	7	7
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Antibiotic	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100
Proximate analysis of diet (%)					
Crude protein (%)	**22.30**	**22.39**	**22.22**	**22.7**	**22.28**
M.E (kcal/kg calculated)	2602.65	2586.1	2568.1	251.8	2534.1
Moisture (%)	8.21	7.98	7.00	7.01	7.81
Ash content (%)	9.81	8.61	10.22	10.01	9.82
Crude fibre (%)	8.25	6.80	7.22	7.25	6.98
Ether extract (%)	14.25	17.80	15.95	13.00	13.15
NFE (%)	35.14	42.29	37.03	42.14	48.52

Composition of Vitamin-Mineral Premix
Vit. A = 400,000 Iu, Vit. D_3 = 800,000 Iu, Vit. E = 9,200mg, Vit K = 800mg, Vit B_1, = 720mg, Vit. B_2 = 2,000mg, Vit. B_6 = 1,200mg Vit. B_{12} = 6,400mg, Niacin = 11,000mg, Pantathonic acid = 3,000mg, Folic acid = 300mg, Biotin = 24mg, Chlorine chloride = 120,000mg, manganese = 16,000mg, iron = 800mg, Zinc = 12,000mg, Copper = 1,200mg, Iodine = 400mg, Cobalt = 80mg, Selenium = 80mg and Antioxidant = 500mg.

A total of 150 snails were used for the experiment which lasted for 10 weeks. The snails were randomly allocated to 5 dietary treatments and each treatment had three replicates with 10 snails per replicate. Five inclusion levels of rumen content (0, 7.5, 15, 22.5, 30%) were fed as treatment to the snails. The feed were supplied *ad libitum* with adequate moisten of pot throughout the experimental period.

Records of initial body weight, weekly weight gain, daily feed intake were kept, while the feed to gain ratio, cost of rearing the snail, gross profitability and feed cost efficiency were calculated. The shell thickness and shell length was measured with the use of micrometer screw gauge and veneer caliper respectively. All data were

subjected to Analysis of Variance using completely randomized block design[19] and significant means were separated using Duncan's multiple range tests[11].

RESULTS

The performance of snail fed different level of rumen content meal (RCM) is shown in TABLE 2. There was no significant effect (P>0.05) of feed on the growth parameters assessed. The snails fed on the Rumen content meal (R.C.M) diets had comparable body weight gain values of 5.87, 6.06, 5.71 and 5.8g respectively for 7.5, 15, 22.5 and 30% RCM diet which "tended" to be higher (P>0.05) than for the snails fed the control diet (0%) with body weight gain of 5.57g.

TABLE 2 : Growth performance characteristics of snails fed rumen content meal (RCM)

	LEVELS OF RCM %						
Parameters	**0**	**7.5**	**15**	**22.5**	**30**	**SEM**	
Initial body weight (kg/snail)	0.181	0.184	0.183	0.173	0.181	0.006	NS
Final body weight (kg/snail)	0.571	0.595	0.607	0.573	0.587	0.007	NS
Body weight gain (g/snail)	5.57	5.87	6.06	5.71	5.80	0.08	NS
Feed intake (g/snail)	32	33	34	33	33	0.63	NS
Feed to gain ratio	5.75	5.62	5.6	5.78	5.6	0.08	NS
Initial shall length (cm)	10.10	10.02	10.33	9.89	10.15	0.07	NS
Final shell length (cm)	11.48	11.33	11.32	11.13	10.94	0.095	NS
Shell length gain (cm)	1.38^{a}	1.31^{a}	1.00^{c}	1.24^{b}	0.80^{c}	0.11	
Initial shell thickness (mm)	0.88	0.86	0.94	0.91	0.85	0.02	NS
Final shell thickness (mm)	1.27	1.23	1.27	1.25	1.35	0.02	NS
Shell thickness gain (mm)	0.39^{a}	0.37^{a}	0.3^{b}	0.34^{b}	0.5^{c}	0.03	NS
Mortality	0	0	0	0	0	0	

NS = Means within the row not statistically no significant (P>0.05)

The feed intake value were highly comparable (P>0.05) for snails on all the experimental diets, but the snails fed on the control diet "seemed" to have the lowest (P> 0.05) feed intake value of 32g.

The feed to gain ratio values were also comparable (P>0.05) for snails on all the experimental diets, although snails fed 15 and 30% RCM diet both had the lowest feed to gain ratio value of 5.6, while snails fed the 22.5% RCM diet seemed to have the highest fed to gain ratio of 5.78.

There was significant effect (P< 0.05) of treatment on the shell length gain. From the result, the control diet (0) and 7.5% inclusion of RCM tended to have the highest and best shell length gain of 1.38 and 1.31cm respectively while 15 and 30% inclusion of RCM seemed to be the least with poor shell length gain of 1.0 and 0.8cm respectively. There were significant effect (P<0.05) on shell thickness gain. From the result, the 30% RCM inclusion "seemed" to have the highest and better shell thickness of 0.5, while the lowest and poor shell thickness was recorded at 15 and 22.5% level of inclusion of 0.3 and 0.34.

TABLE 3 shows the economics of snail production using RCM. There was significant differences in the cost of feeding the snails (P<0.05). A reduction was observed with increase in the level of rumen content meal in the diet. The cost of feed for snails fed on the RCM diets were highly comparable of 62.9, 61.1, 60.4 and 59.3 N/kg respectively for 7.5%, 15% 22.5% and 30% which tended to be lower than the control diet (P<0.05) of 68.9 N/kg. Although, the total cost of raising the snail from the first week to the last week of the experiment for 30% RCM inclusion was better than the control. Hence the gradual increase of Rumen content meal in the diet reduced the cost of producing feed N/kg.

TABLE 3 : Economic of snail production fed RCM.

Parameters	**LEVEL OF RUMEN CONTENT FED**					**SEM**
	0%	**7.5%**	**15%**	**22.5%**	**30%**	
Cost of feed (N/kg)	68.9^{a}	62.9^{b}	61.1^{b}	60.4^{b}	59.3^{b}	0.69
Cost of feed consumed (N/kg)	154.3^{a}	145.3^{b}	145.4^{b}	138.6^{b}	136.9^{b}	6.15
Cost of rearing the snail (N/kg)	254.3^{a}	245.3^{b}	245.4^{b}	238.6^{b}	236.9^{b}	6.15
Selling price of snail	350	350	350	350	350	
Profitability (N/snail)	95.7^{a}	104.7^{b}	104.6^{b}	111.4^{b}	113.1^{b}	6.5
Gross profitability	37.6^{a}	42.7^{b}	42.6^{b}	46.7^{b}	47.7^{b}	3.58
Feed cost efficiency	0.546^{a}	0.679^{b}	0.697^{b}	0.773^{b}	0.804^{b}	0.04

Means within the same row, with the same superscript letter are not significantly different (P>0.05).

The cost of feed consumed and the cost of rearing the snail also reduced as the level of Rumen content meal increased in the experimental diet. Although, it was noted that 30% RCM inclusion had the best value and most profitable, while the control diet had the highest cost but less profitable and also not economical in terms of production. In term of profitability, 30% RCM inclusion had the best profit of 133.1 N/snail, though they were comparable with other snails fed different level of

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RCM inclusion of 104.7, 104.6, 111.4 for 7.5%, 15% and 22.5% respectively, but the value were different from the snail fed the control which is 95.7 N/snail ($P<0.05$).

The gross profitability was also known to be highest at 30% RCM inclusion of 47.7, while the control 0% has the least value with poor gross profitability of 37.6.

DISCUSSION

The satisfactory performance without any detrimental effects such as disease symptom and mortality indicate that the rumen content meal is not toxic to the snail, if properly processed it could be safely included in the snail diet.

Adeniji[5], reported that the blood rumen content, when well processed is not harmful to layers and the utilization of these waste would reduce the unhygienic environment of our abattoirs. Awotoye[8], also reported that a gradual decrease in average total weight gain of experimental broiler birds when dietary inclusion level of blood rumen content increased.

The quality of feed product has not been affected by feeding waste. Silver and Van. H[17], reported that dairy cow fed diet containing up to 36% poultry waste exhibit the side effect of milk quality as judged by composition and flavor. Fontent[13], found no adverse effect in sheep fed for 80days on diet containing up to dry heat at 1500c for 4 hours. Fetuga[12], also reported that there was no deleterious effect on egg quality as a result of feeding waste. Similarly, this has justified that in the 30% inclusion of RCM which was 0.5cm had the better and thicker shell.

Moreso, the gradual increase in feed consumption with increase in the level of rumen content in the diet may be as a result that the animal consumes more feed to meet their energy requirement[6,15].

The differences in feed intake may be attributed to the improvement in the value of the rumen content meal by the other ingredient, thereby reducing the fibre content. Result of feed intake in relationship with rumen content level of inclusion showed that RCM at 15% inclusion had the highest value of 34g of feed intake when compared with the control which had the least of 32g.

In the weight gain, there was a slight increase, but the increase had no significant differences. Though 15% inclusion of RCM has the highest weight gain of 6.06g.

The price of 1kg of feed was found to be the cheapest at 30% Rumen content inclusion, while the most expansive was recorded on the control diet. The price of the diet decreases as the inclusion level of rumen content increase. Therefore, the increasing cost of protein concentrate could be reduced with the inclusion of rumen content meal[4].

The inclusion of Rumen content meal showed great increase in profit and gross profitability. The economic sense of such a reduction on cost of feed will only depend on the utilization of the feed and the weight gain would be the most economically advantageous diet. It was shown that the feed to gain ratio were comparable, but the best value in the results were observed in 15 and 30% level of RCM inclusion.

In conclusion, throughout the experiment, 30% Rumen Content Meal is being recommended.

Moreso, the experiment showed that increase in the level of Rumen Content Meal by reducing the level of conventional feed stuff could reduce the cost of feed production.

In conclusion, considering the effect of RCM on weight gain, feed to gain ratio and cost reduction, it is obvious that 30% RCM inclusion gave the best result and the recommended level of inclusion.

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