Evaluation of the Effect of Dried Rumen Digesta on Feed Intake and Growth Performance of Giant African Land Snail (*Achatina achatina*)

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ABSTRACT

***Background**: The seasonality of plant materials and the high cost of purchasing the ingredients and in formulating snail feed are the factors that deter the rearing of snails. Effort should be directed towards feeding snails with cheap and locally available, but rich feed ingredients to minimize the effect of high cost of compounded feed, to ensure continuity of snail production all year round.*

***Objective:** The study examined the effect of dried rumen digesta on feed intake and growth performance of Giant African land snail (Achatina achatina).*

***Methods:** The study adopted an experimental research with completely randomized design (CRD) while simple random sampling technique was used to obtain forty-eight Giant African land snail was used as sample for the study. The experimental diets were formulated using adjustable Pearson's square method of feed formulation to contain dried rumen digesta at 0%, 5% and 10% inclusion level respectively. The feed intake was measured by a weigh-back technique while the length and width were measured using Venier caliper. One way Analysis of Variance ANOVA was used for the running of the analysis.*

***Results**: The feed intake of Giant African land snail (Achatina achatina) in treatment 2 (T2) with 10% rumen digesta showed the highest mean value of 121.05, showing that rumen digesta is useful as an economic replacement for energy feed ingredients as cereals.*

***Conclusion:** Extension agents should embark upon mass sensitization on benefits of feeding dried rumen digesta to snails at the levels of 5-10% for a cost effective snail production.*

Keywords: Snail, Dried rumen digesta, Growth, Performance

INTRODUCTION

The increasing demands for animal protein coupled with more stringent economic conditions have necessitated greater interest in the production of cheap and very prolific micro-livestock like snail amongst others to supplement other sources of animal protein. This serves the benefit of not only providing farmers and rural households with alternative sources of income (1) but as well, providing a low cost, high nutritional animal proteins as alternatives for the high priced conventional protein sources as chicken, beef, pork, fish, mutton and chevon (2). Snail and snailery are recently gaining popularity in many countries across the globe with a flourishing

international trade in Europe and North America (3).

Thus, in order to make snail supply sufficient, its rearing is very vital to supplement the conventional method of picking snails from the wild. Giant African Land Snails are mostly preferred for its larger size at maturity, quality nutritional compositions of proteins, essential amino acids, vitamins and minerals (especially iron); low fat and cholesterol levels; and its therapeutic roles in the management of such ailments as hypertension, conjunctivitis, diabetes, iron deficiency and anemia (4).

Snails feed on leaves grains, tubers, fruits as well as compounded feeds. According to (5), the result in snail rearing is obtained through the mixture of fruits and leaves of common crop supplemented with minerals and vitamins. The researcher further reported that vegetables, leaves, fruits, tubers, kitchen wastes as well as compounded feeds could be used to feed snails(5). The seasonality of plant materials and the high cost of purchasing the ingredients and in formulating snail feed are the factors that deter the rearing of snails throughout the year (6). Adequate direct effort on feeding snails with cheap locally available but rich feed ingredients to minimize the effect of high cost of compounded feed and seasonality of plant materials to ensure continuity of snail production all year round is encouraged (6). However, one of the possible sources of this is Dried Rumen Digesta (DRD). Rumen digesta is the solid matrix or ingested feed that is at different stages of degradation with saliva as the rumen liquor as well as microorganisms in the rumen of ruminant animals. It is animal waste product collected from the abattoir, dried and utilized in compounding snail feed. Rumen Digesta not only serves as a feed nutrient but when re-cycled will also reduce disposal and environmental pollution problems (7).

Essentially, according to (6) dried rumen digests contains 19.4% crude protein (CP) and 42.2% neutral detergent fibre (NDF) and it consists of the end products of microbes metabolic activities such as microbial protein, amino acids, vitamins and volatile fatty acids. The percentage crude protein and fibre content obtained in rumen digesta indicates that it could be dried and used in formulating snail feed to reduce cost of production and foster all year rearing of snails (8). It could be collected from the abattoir almost on daily basis at no cost at all. Thus, instead of allowing such waste to cause environmental pollution and nuisance, there is the need to study its effect as feed ingredient on the growth performance of snails and since there is limited available information on the growth implications of feeding rumen digesta to snails (9). This study therefore was designed to evaluate the effect of dried rumen digesta on feed intake and growth performance of Giant African land snail (*Achatina achatina*). Specifically, the study sought to: determine the effect of dried rumen digesta on Giant African land snail (*Achatina achatina*) increase in length and evaluate the effect of dried rumen digesta on Giant African land snail (*Achatina achatina*) increase width.

MATERIALS AND METHODS

This study adopted a true experimental research, which investigated possible causes and effects relationship by exposing two experimental groups to two treatment conditions and comparing the results to one control group not receiving the treatment management of experimental variables and conditions manipulation Completely Randomized Design (CRD) with equal replication (10). It involved random assignment of snails treatments with two replications each thus having twelve experimental units. Each replicate contained four snails that were equally assigned to a pen. This type of experimental design as the strongest type of design and one of the most effective in minimizing the threats to experimental validity. This design also permits that at the time of assignment all the groups are equal (11).

The study was conducted at the Farm section of Michael Okpara University of Agriculture, Umudike Abia state(MOUAU) and the Biochemistry Section, National Root Crop Research Institute, Umudike; Abia State, Nigeria. Economically, Abia State is based around the production of crude oil and natural gas along with agriculture, mainly of livestock and crops like snails, goat, yams, maize, taro, oil palm, and cassava. It focused on the specie of African Land Giant Snail called *Achatina achatina*. The population for this study consisted of sixty-five Giant African land snail purchased from a snail dealer at Ogbe- Ogonogo Modern Market, Delta State. However, simple random sampling technique was used to obtain forty-eight Giant African land snail which was used as sample for the study through the following step:

i. Assigning numbers to all the snails on the shell

with paint.
ii. Transferring these numbers to pieces of papers.
iii. Rolling each paper and putting them in a basket.
iv. Getting two students to select forty-eight pieces of papers
V. The numbers selected on each paper taken was used to select the appropriate snail.

Materials and Preparation of Diets for the Experiment

Materials: The materials used in formulating the various diets are:
(i) Carbohydrate feed ingredient: Maize
(ii) Protein feed ingredients: Soya bean meal, Fish meal and Rumen digesta
(ii) Mineral feed ingredients: Bone meal and Oyster shells.
(vi) Fats and oil feed ingredient: Fish meal
(v) Fibre: Wheat offal and Rumen digesta
(vi) Additive: Mineral premix.

Preparation:

The rumen digesta was collected from Abakiliki abattoir immediately after the animals were slaughtered between 7.00 – 8.00am. The rumen digesta was sun dried on a clean nylon spread on a concrete floor to moisture content below 15%. However, the moisture content below 15% was achieved by subtracting the dry weight from the initial weight. With the use of rubber hand gloves, the researcher properly shredded and removed the foreign objects like stone to allow for proper milling and mixing with other feed ingredients. The rumen digesta was then milled, bagged and stored in a cool dry place prior to using it to formulate feed at different level of percentage.
The other feed ingredients (feedstuffs) used for the study were purchased from Abakiliki main town market, Ebonyi state and milled at a feed mill around Abakiliki, Ekwo road. The various feed Samples were taken to the Biochemistry laboratory of National Root Crop Research Institute, Umudike; Abia State, Nigeria for proximate (chemical) analysis, using formulated experimental diets with adjustable Pearson's Square method of feed formulation to contain dried rumen digesta at 0%, 5% and 10% inclusion levels respectively. However, the control diet (0%), labeled T_0 did not contain rumen digesta.

Certification of Snails for Safety

The snails used for the experiment were certified, thus polymerase chain reaction test (RT-PCR) was carried out for disease infection by a specialist in Animal Science Department, Michael Okpara University of Agriculture, Umudike Abia state(MOUAU).

Experimental Procedure and data collection

The forty-eight snails were randomly assigned to three treatment groups with three replicates each in a completely randomized design (CRD), Thirteen pens were used and pen consisted of five snails. Each pen constituted an experimental unit. A week before the assign of the snails, the pens were thoroughly washed, disinfected under the sun. The floor of the pen was covered with loamy soil heated for some minutes and allowed to cool to about 6cm high from the bottom. The heating was done to prevent pathogenic infestation in the pen. The feeders and drinkers were thoroughly washed and dried. Seven days trial feeding was done before the commencement of the experiment to allow for physiological adjustments. Water was provided ad libitum and each treatment group was fed with a particular diet daily for twelve weeks. The feed intake was determined daily by a weigh-back technique. This means that a known quantity of fresh feed given to each experimental unit was weighed and recorded. In the morning of the next day, the left over in the feeder as well as feed wasted on the floor was collected, weighed and recorded. In this way, the quantity of feed consumed was calculated as (quantity given-quantity leftover). This was the routine for feeding the snails throughout the experimental period, which lasted for twelve weeks. The drinkers and feeders were emptied and washed on daily basis before new feed and water was served. Water was also sprinkled on the floor (soil) on daily basis to maintain adequate humidity and temperature in the pen. At the end of every three weeks, the soil was removed and replaced to prevent any pathogenic manifestation in the pen.

Procedure for Data Analysis

Data collected was subjected to One Way Analysis of Variance (ANOVA) for a completely randomized design (CRD) as described by (12) and the hypothesis was tested at 0.05 level of significance. However, the difference between the treatment means was separated using Duncan's New Multiple Range Test (DMRT)

RESULTS

The results are presented in Table i and ii below

Table i,

The Increase in Length of Snails Fed Graded Levels of Rumen Digesta

Treatment	Mean	Standard Deviation	Standard Error Mean	Degree of Freedom	F- Ratio	Sig.
T_0(0%)	80.23	2.04				
T_1 (5%)	80.73	0.21	0.73	11	1.134	0.392
T_2 (10%)	82.50	4.50				

Table ii,

The Increase in width of Snails Fed Graded Levels of Rumen Digesta

Treatment	Mean	Standard Deviation	Standard Error Mean	Degree of Freedom	F- Ratio	Sig.
T_0 (0%)	39.33	0.85				
T_1 (10%)	42.50	4.25	0.82	11	0.7161	0.57
T_2 (15%)	39.63	3.86				

The result in Table i show that there are slight difference in the increase of the mean length of various treatments with treatment two (T_2) having the highest increase of 82.50. This was followed by the snails in treatment one (T_1) containing 5% rumen digesta with the mean value of 80.73. The snails in treatment zero T_0 and treatment indicated 78.80 mean value.

The result in Table ii indicated slight difference in the increase of the mean width of various treatments with treatment one (T_1) having the highest increase with mean value of 42.50. This was followed by the snails in treatment two (T_2) with the mean value of 39.63, while the snails in the control group (0%) showed mean value of 39.33.

DISCUSSION OF THE FINDINGS

The data in Table i showed that the snails in treatment two (T_1) recorded the highest mean feed intake of 121.05 at the end of the experiment and had the highest feed consumption rate. Thus, rumen digesta, which is a non-competing and non-conventional feedstuff for human beings, was found useful as an economic replacement for energy feed ingredients in enhancing feed consumption rate. In addition, snail fed with Rumen digesta diets performed generally better than the control group. This improved performance could be attributed to higher protein component of the undigested and partially digested feed protein material due to the influence of microbial protein. Moreso, it maybe because crude fiber activates the intestine and results in more occurrence of peristaltic movement, more enzyme production leading to efficient digestion of nutrients (13). However, the use of dried rumen digesta in formulating snail feed is thereby advocated. This result in table i is in line with (14) who reported that increased feed consumption rate has relationship with increased feed composition and palatability. Snails in all the diets containing rumen digesta had higher feed intake values with the control feed (0%) having the least feed intake value. This also agrees with the report of (15), who stated that the use of rumen digesta in livestock feeding has no harmful effect on feed in take performance.

It can be inferred that rumen digesta was palatable, safe and free from toxins.

The result as summarized in table i and ii clearly indicated that there was highest increase in the mean length (82.50) and mean width (42.50) of snails in treatment two (T_1). In comparing this result with other treatments (T_0, T_1 and T_2) one can infer that the snails in treatment two (T_1) performed better. Using the data in Table 1 and 2, there was no significant ($P > 0.05$) difference in the length and width of snails fed graded levels of rumen digesta. However, the result obtained indicated clearly that incorporating dried rumen digesta up to the level of 10% in the snail diet is acceptable to snails and will meet the growth requirement thereby eliminating the need for costly energy supplements. Thus, rumen digesta, which is a non-competing and non-conventional feedstuff for human beings, was found useful as an economic replacement for energy feed ingredients as cereals. The use of dried rumen digesta in formulating snail feed is thereby advocated. The improved performance could also probably be due to adequate dietary crude fiber level of rumen digesta. This is because crude fiber activates the intestine and results in more occurrence of peristaltic movement, more enzyme production leading to efficient digestion of nutrients. This is not in conformity with the result of (16) who reported a significant ($P < 0.05$) difference in the feed intake for rabbits fed 30% rumen digesta inclusion. More so, it agrees with the report of (7) who reported that birds on diets containing dried rumen digesta recorded higher body weight gain than the control (0%) group.

Conclusively, the findings of this study indicated clearly that incorporating dried rumen digesta up to a level of 10% in the snail diet is acceptable to snails and will meet the growth requirement thereby eliminating the need for costly energy supplements. Thus, rumen digesta, which is a non-competing and non-conventional feedstuff for human beings, was found useful as an economic replacement for energy food ingredients as cereals. The use of dried rumen digesta in formulating snail feed is thereby advocated to boost commercial snail production for economic recovery in Nigeria.

CONCLUSION

Based on the findings of the study, the following conclusions were made.

Rumen digesta could be fed to snails at 10% level of supplementation thus providing a cheaper source of fee and helps in clearing the abattoir wastes to reduce associated environmental health hazards. It can be inferred from the results of the experiment that rumen digesta could be supplemented with snail feed to ensure all year round availability and reduction in cost and competition from man and industries for conventional feed ingredients.

RECOMMENDATION

The following recommendations were put forward;

1. Extension agents should embark upon mass sensitization on benefits of feeding dried rumen digesta to snails at a levels of 10-15% for a cost effective snail production.
2. The government should sponsor seminars and workshops for snail farmers and the public who are interested in snail farming because of the nutritional and medicinal value of snail and train them on how to process and use rumen digesta to compound feed for snails to ensure commercial snail farming and all year availability of snail at cheaper rate.
3. Similar study should be conducted to increase the percentage inclusion of rumen digesta but care should be taken to collect enough rumen digesta that will be used to compound all the experimental diets

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