PERFORMANCE EVALUATION OF GROWER SNAILS (*Archachatina Marginata*) FED VARYING LEVELS OF GROUNDNUT CAKE

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ABSTRACT
This study was carried to determine the effects of groundnut cake (GNC) fed to grower snails as the main protein source at varying levels of inclusion 23%, 25% and, 27%. Protein is an important constituent of the animal body organ, as snails need protein for fast growth and vital to enhance growth traits for better returns on investment The initial average weight of snails was 35.61g, the experiment was for 12 weeks and sixty-four (64) grower snails were divided into four (4) groups of sixteen snails each per treatment, replicated four (4) times. The parameters examined were growth performance, feed intake, feed conversion ratio, carcass, and shell characteristics. Data collected were analyzed by use of one-way analysis of variance and significant means were separated using Duncan's multiple ranged test at a 5% level of probability using SAS, 2011. The study showed that snails fed 27% of GNC supported higher body weight gain, live weight, and dressing percentage. No significant ($P<0.05$) differences were recorded in the final shell circumference, shell circumference gain, final shell length, and shell length gain. Formulated ration containing as much as 27% GNC will go a long way in enhancing growth of snails, ensuring all year availability of feed for commercial snail production as the natural feed resources is scarce during dry season.
Keywords: Performance, Evaluation, Grower snail, levels, Groundnut Cake

INTRODUCTION
African giant Land Snails (GALS) (*Archachatina marginata)* are invertebrate which is soft-bodied and has outer hard shell covering that is known as an exoskeleton which is conveyed with the body when the animal is moving. Snail meat is highly nutritious and contains about 19.53g of protein/100g of fresh meat, has low-fat content of 2.44%, rich in calcium (126.4mg/100g) and iron (2.29mg/100g) (Babalola and Akinsoyinu, 2009). The meat is low in cholesterol and a good source of vital minerals required for normal tissue development and maintenance. Snails belongs to a class of animals called Gastropoda. The main purpose of using GNC is to find an alternative feed for snails (formulated diet) as snails are known to mainly feed on natural resources such as water leaves, oil palm fruits, okra leaves, pumpkin leaves, and decaying organism etc. As commercial production of snail is challenging because of the slow growth of snails and scarcity of natural feed sources which is needed in the feeding of snails, there is need to use formulated diet to reduce the difficulty encountered with the use of natural resources such as scarcity of herbage all through the dry season and to make snail available all through the year-round as demand for snail exceed supply. However, these conventional animal feeds have mineral/vitamins needed by snails for growth which are lacking in some natural feed resources (Eze, Akpodiete, Okonkwo and Erubetine 2013).

MATERIALS AND METHOD
The experiment was carried out at the Federal College of Education (Technical) Teaching and Research Farm, Asaba, Delta state of Nigeria**.** The grower snails of the spice (*Achachatina marginate)* with an average weight of 35.61g were purchased from Songhai farms Amukpe, Sapele Local government area of Delta State of Nigeria.
The snails were housed in wooden hutches measuring 28cm × 60cm × 35cm, constructed under a roofed shade to prevent direct sunlight on the snails. The hutches were filled with humus soil up to a depth of 15cm and moistened with water. A total of sixty-four (64) grower snails were randomly divided into four (4) groups of sixteen (16) snails each per treatment, which consists of four (4) replicates of four (4) snails each. The snails were fed with three (3) experimental diets which were formulated to contain groundnut cake at 23%, 25%, 27%, and a control diet of 18% GNC as the main protein source. Clean water was sprinkled on the snails every morning and evening and also a flat plate was also used to provide water for the snails to allow them to have access to water at all times.

The experiment was carried out for twelve (12) weeks. Droppings were removed every morning before giving fresh feed to maintain a clean environment inside the hutch.
Data were collected on growth performances, feed intake, feed conversion ratio, and carcass characteristics.
Bodyweight was taken at the commencement of the experiment and on weekly basis, this was done on a replicate basis for twelve (12) weeks.
Shell length was done by measuring the long axis of the snail on an individual basis with the use of a flexible measuring tape. This was done fortnightly.
Shell circumference was done using a venial caliper around the largest circumference of the shell on an individual basis. This was done fortnightly too.
Feed intake was obtained daily as the difference in weight between the feed given and the feed remaining. This was done throughout the entire period of the experiment.
At the end of experiment two (2) snails each was collected from each replicate given a total of eight (8) snails in each level, totaling thirty- two (32) snails out of sixty- four snails used in the experiment. The live weight of each snail were taken and the meat of the snails was carefully removed from the shell with a hooked pin and dried carefully with the use of a paper towel and weighed. The contents were separated into edible and non-edible portions, the weight of the edible and non-edible portions was taken. The empty shells were air-dried for 48 hours and weighed. Carcass and shell characteristics were also obtained
The snail shell at the aperture was placed between the jars of a micrometer screw gauge and readings were taken. This was repeated for each of the thirty- two (32) snails.
Data collected were subjected to one-way analysis of variance and significantly different means were separated with Duncan's multiple ranged test at 5% level of probability using the statistical analysis system (2011).

Table 1: Gross composition of the experimental diets

Ingredients	**Control Diet**	**Experimental diets (GNC)**		
	18%	23%	25%	27%
Yellow maize (9%)	58.00	55.00	49.00	44.95
Blood meal (80%)	12.00	12.00	12.00	12.00
Wheat bran (15%)	16.00	16.00	16.00	16.00
Groundnut cake (45%)	10.00	13.00	19.00	23.05
Bone meal	3.00	3.00	3.00	3.00
Vit. premix	1.00	1.00	1.00	1.00
Total	**100**	**100**	**100**	**100**

RESULTS AND DISCUSSION

Table 2: Growth performance of grower snails *(Archahatina Marginta*) fed experimental diets

Parameters	**Control Diet**	**Levels of Inclusion**		
	18%	**23%**	**25%**	**27%**
Initial body weight (g)	35.61	35.61	35.61	35.61
Final body weight (g)	41.55^{d}	41.88^{c}	42.47^{b}	45.05^{a}
Body weight gain (g)	5.94^{d}	6.27^{c}	6.86^{b}	9.44^{a}
Initial shell circumference (cm)	11.05	11.05	11.06	11.05
Final shell circumference gain (cm)	12.01	12.01	12.01	12.01
Shell circumference gain (cm)	0.96	0.96	0.95	0.96
Initial shell length (cm)	6.02	6.02	6.01	6.02
Final shell length (cm)	6.06	6.06	6.06	6.07
Shell length gain (cm)	0.04	0.04	0.05	0.05
Total feed intake (g)	372.80^{b}	372.08^{b}	385.38^{a}	388.57^{a}
Feed conversion ratio (g)	62.76^{a}	59.34^{b}	56.18^{c}	41.16^{d}

a,b,c: Means within row bearing the same superscript are not significantly (P>0.05) different.

Results in table 2, showed that snails fed 27% of GNC had the highest final body weight and body weight gain while snails fed 18% CP had the least final body weight and body weight gain. This is in line with the findings of Ugwuowo (2011) that animal growth depends greatly on the level of protein intake and utilization of the feed materials. Ani *et al* (2013) also observed that snails perform better

when fed higher protein levels and energy levels. Significant (P<0.05) differences were not recorded in the final shell circumference, shell circumference gain, final shell length, and shell length gain. This may be attributed to the slow growth rate of snails which is in line with the finding of FAO (1986).

Snails fed 25% and 27% inclusion level of GNC had higher feed intake value however they also had the least feed conversion ratio because of the high weight gain recorded. This is because a low feed conversion ratio is an indication of a high-quality feed. It has also been established that feed consumption increases with increase protein levels (Bright 1996).

Table 3: Carcass characteristics of grower snails *(Archachatina marginata*) fed experimental diets

Parameters	Control Diet	Levels of inclusion		
	18%	**23%**	**25%**	**27%**
Live weight (g)	40.90^{d}	41.87^{c}	42.41^{b}	44.05^{a}
Dressing percentage	15.85^{d}	17.95^{c}	19.11^{b}	20.57^{a}
Visceral percentage	6.75^{b}	6.99^{b}	7.39^{ab}	7.73^{a}
Shell thickness (cm)	1.29^{b}	1.28^{b}	1.30^{b}	1.38^{a}
Shell weight (g)	8.25^{b}	8.40^{b}	9.02^{a}	9.36^{a}

a, b, c: means within rows bearing the same superscript are not significantly (p>0.05) different.

Significant (P<0.05) differences were recorded in all the parameters measured. Snails fed 27% groundnut cake had higher live weight, dressing percentage, visceral percentage, shell thickness, and shell weight while the control diet of 18% CP has the lowest live weight and dressing percent. This is in agreement with the result of Ejidike (2007) who discovered that animal performance is greatly dependent on the levels of protein intake and utilization. Ugwuowo and Ani 2011 also discovered that high dietary protein encourages a high percentage of edible weight. This is in harmony with the works of Ani *et a l* (2013) that as a rule heavier animal are expected to have higher carcass yield than lighter ones. However, no significant (P<0.05) differences were recorded in the visceral percentage, shell weight and shell thickness amongst snails fed 18% and 23% of the groundnut cake.

CONCLUSION AND RECOMMENDATIONS

Groundnut cake at 27% level of inclusion braced higher final body, body weight gain, live weight, dressing percentage, and shell thickness. Nevertheless, GNC at 25% also supported higher visceral percentage and shell weight. Snails feed 18 % of GNC had the lowest final body weight, body weight gain, and the highest fed conversion ratio. Formulated ration containing as much as 27% GNC will go a long way in enhancing growth of snails, ensuring all year availability of feed for commercial snail production as the natural feed resources is scarce during dry season.

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