Growth Response of Tiger Giant Land Snail Hatchlings *Achatina Achatina Linne to* Different Compounded Diets

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Abstract
This experiment was conducted at the snailery unit of the Delta State Polytechnic Ozoro to study the effects of different compounded diets on the growth response of hatlings Tiger giants land snail (Archatina archatina). Different feed ingredients were used for the compoundment. Three diets were formulated with crude protein percentage of 15%, 20% and 25%. A 2 x 3 factorial arrangement in CRD was used with six treatments. Each treatment was replicated thrice with five snails per replicate. The trial lasted for 90 days. The protein source main effects were significant (P<0.05) in average daily feed intake which was higher in feeds with soyabeen cake than groundnut cake. The higher crude protein percentage diet influence growth rate of the hatchlings more as well as been significant (P<0.05) in feed conversion ratio. Mortality was not recorded during the experiment. The diet with higher protein percentage 25% should be considered most appropriate since the growth rate of snail hatchlings increased as the crude protein level increased in the compounded diet.

INTRODUCTION

The present level of livestock production cannot meet daily demand for animal protein , this have affected the animal protein intake by Nigerians which is below 67g as recommended by the World Health Organization (Kehinde *et al.*, 2002), and thus has led to an acute malnutrition amongst the greater percentage of the rural populace [FAO,1986]. Therefore, calls for urgent strategies for promoting micro livestock is needed to bridge this gap, especially, as suggested by Ebenebe (2000) that it is high time we integrate into our farming system some non-conventional meat sources like snails.

Raising snails has become a veritable micro livestock practice in recent times because of increased animal protein shortage in Nigeria, its availability and acceptability nationwide, potential for export, including the emerging technologies for their production. However, successful snail production involves among other things requires proper nutrition to maintain body tissue, grow, reproduce and perform other biological functions. Field and On-farm feed preference studies (Iglesias and Castillejo, 1999; Chevalier *et al.*, 2000; Chevalier *et al.*, 2003; Ebenso and Adeyemo, 2011) have demonstrated the capacity of snails to choose their feed when given free choice feeding and to retain memories of preferred feeds.
Snails are food rich in protein and iron. Imevbore and Ademosun (1988) indicated that snail meat has 88.37% and cholesterol content (20.28mg/100g fresh sample). Snail meat is also a rich source of mineral, particularly calcium and phosphorous with values of 185.70mg/100 and 61.24mg/100g (dry weight basis), respectively. Snail meat is rich in essential amino acids like lysine, leucine, isoleucine and phenylalanine and also high in iron to about 45-50mg/kg (Imeivbore, 1990, Stivener, 1992).

The Giant Tiger land snails *Achatina achatina* is an important source of animal protein for West African forest-dwelling ethnic groups, and commercial farming of these snails holds great promise (Hodasi, 1979). They are the largest extant land snail species known, with shells that grow to a length of 18 cm (7.1″) and a diameter of 9 cm (3.5″). They are omnivorous animal, feeding on decaying materials, their own wastes (coprophagia) and eating dead or weak mates under certain conditions (cannibalism). Tiger Giant land snails (Achantina achantina) have veracious appetite. Adeyeye (1996) reported that the snails ability to utilize a variety of readily available feeding materials to achieve appreciable weight gain. They are known to eat at least 500 different types of plants, Kehinde *et. al.,* (2003) reported optional performance snails when fed luceana and glyricidia leaf supplements at 5%, and including peanuts, beans, peas, cucumbers and melon, wide variety of ornamental plants, tree bark, and even paint (Akintomide, 2004). Snails also utilize grains, waste products such as maize shaft, plantain peels, and succulent vegetables including cabbage, pawpaw, pineapples, nuts, cherry, water leaf, cassava, coco-yams, soft shoots and lettuce (Okafor, 2001). These varieties of food, if not properly compounded and formulated into a dietary whole ration will result in wastage due to the non optimization of biological yield of the snail.

The provision of compounded diet has richly enhanced the growth performance of mullosca, particularly when the feed ingredients are specifically formulated towards achieving the nutritional requirement of the snails. Hence, Stievenart (1992), Omole et al. (2000) and Ejidike (2001) pointed out the need to use complete balanced feeds in snail production. According to Olomu (1995), protein functions mainly on tissue growth, carbohydrate (in nitrogen-free extract) provides the necessary energy for metabolic activities, while calcium functions in shell growth (Akinnusi 1988). The growth of snails like other animals differs with respect to what they are fed. There is also a strong and positive relationship between nutrient content of the feed and growth of snails (Okonkwo *et al.,* 2000). Adu *et al* (2002) pointed out the need for research studies on the use of compounded ration for snail in order to solve the problem of scarcity of fruits, tuber and leaves during the dry season. The provision of adequate feed (Okonkwo *et al.,* 2000), supplementary vitamins, calcium, minerals and water during the dry season is capable of thwarting the aestivation cycle and enhances greater productivity besides preventing drug wastage and bacteria growth over time. Thus, this study was to investigate the growth response of giant tiger land snail *Archatina archatina* fed different compounded diets from different feed sources and determine the morphological growth of snail hatchlings in response to compounded diet.

MATERIALS AND METHOD

The study was conducted at the snailery unit of the research and demonstration farm department of Agricultural Technology Delta State Polytechnic Ozoro. The snails were reared under intensive system of production using tyres in captive garden pens. Four rim 17 tyres piled up, filled with sun baked soil from the second tyre downward and covered with mosquito netting were used to house the experimental snails.

The feed ingredients used for the research were procured from Ozoro weekly market. Two hundred and forty, 8 weeks old Tiger Giant land snails (Achatina achatina) were used for the study. The snails were randomly divided into groups of 15 snails each. The groups were randomly assigned to 3 diets in a 3x2 factorial arrangement involving three levels (15%, 20%, and 25%) of protein and 3 energy levels (2650, 2960, and 3570 ME Kcal/kg) The composition of the diets is presented in Table 1. Each treatment was replicated 3 times with 5 snails per replicate placed in forty eight 17 rim old tyres measuring 50cm in diameter and 20cm in height. The tyres were filled with sieved sun baked loamy soil at 10cm depth and

wetted daily. Feed and water were provided ad libitum throughout the period of the study which lasted for 16 weeks. The initial weight of the snails was taken before experimental feeds were given. Data on weight gain, feed intake, live body weight, shell length, shell width and shell thickness was collected weekly using a venier caliper and micrometer screw gauge.
The proximate composition of the experimental diets were carried out according to the method of AOAC (1990), while data were analyzed using SAS (1995). Feed conversion ratio (FCR) was calculated as feed: gain, feed intake was calculated from feed intake values and feed efficiency ratio (FER) as weight gain divided by protein intake, feed cost per kg weight gain was calculated as feed cost per kg x FCR. The snails were monitored on daily basis to detect and isolate sick and dead ones. Data obtained were subjected to analysis of variance using GenStat statistical software (2008).

RESULT AND DISCUSSION

Growth response of the *A. archatina* hatchlings in the three compounded diet treatments show that there was significant differences ($p<0.05$) on weight gain for hatchlings fed feed of diet protein levels (20% or 24% crude protein) and those fed compounded diet of lower protein level (15% crude protein). However, the highest weight gain was obtained in hatchlings fed 24% crude protein diet with no significant difference ($p>0.05$) with those hatchlings fed 20% crude protein diet. The morphological parameters (shell length, shell width, shell apertures) showed a similar trend of significant differences ($p<0.05$) among the treatments. The *A. archatina* hatchlings fed on 24% crude protein diet had the highest feed conversion efficiency but no significant difference ($p>0.05$) with those hatchlings fed on 20% crude protein diet.
The Growth performance and weight gain of the *A. achatina* hatchlings were a measure of protein level of the compounded diets that contributed to the differences in the hatchlings growth. Compounded diets with crude protein levels of 20% and 24% had similar ($p>0.05$) influence on the growth performance of *A. achatina* hatchlings, and both performed significantly ($p<0.05$) higher than diet compounded with 15% crude protein as noted by Ogbu *et al.* (2014) that farmed snails will perform best if the most preferred feed materials are provided at the optimal period of feed intake.

Snail mortality was not recorded throughout the experiment. This showed that the compounded diets do not have any nutritional disturbance or toxicity on the snails. Hatchlings shell length, shell width and shell apertures conformed to the growth rate as recorded with weight gain showing a similar trend of significant differences ($p<0.05$) among the treatments as reported by
The *A. achatina* hatchlings fed on 25% crude protein diet had the highest feed conversion efficiency though with no significant difference ($p>0.05$) with those hatchlings fed on 20% crude protein diet. Productive protein value (PPV) increased with increasing crude protein levels. Growth performance of *A. achatina* on different studies based on different plant food materials cannot be directly compared with formulated diets because of differences in protein and energy contents (Esobe, 1986) Moreover, the size, age, environmental conditions and the nutritional history of the experimental snails in the various experiments differ. *A. achatina* hatchlings are capable of utilizing artificial diets effectively as reflected by the general low FCR that decreased with increase in protein level of the diets; and increase in the body protein deposit in the carcass of the hatchlings at the end of the feeding trials. *A. achatina* hatchlings fed on 25% crude protein diet having the highest feed conversion efficiency (97.94%) though with no significant difference ($p>0.05$) with those hatchlings fed 20% crude protein diet. There were significant differences in the mean monthly feed intake of the growing snails and mean weekly ($P < 0.05$). Growing snails on 24% crude protein diet

had a higher percentage of feed intake which can be attributed to their age as interpreted by their high weight gain as observed by Akegbejo and Akinnusi (2000)., that the low weight gain recorded in all the treatments in an experiment conducted for adult snail could be due to the effect of age on the snails since the snails were advanced in age.

SUMMARY AND RECOMMENDATIONS

Compounded diet with soyabean ingredients were consumed more than groundnut cake based diets. The efficiency of utilization of these diets at the varying protein levels were best at 20% crude protein which was shown with the highest value of the protein efficiency ratio of 3.69.. Each of the crude protein level in protein efficiency ratio is similar to the corresponding crude protein level in the other protein source while the weight of the snails fed 25% crude protein from groundnut cake gave the best. The percentage weight increased as the crude protein levels increased. Soyabean meal is, therefore, recommended as the best alternative source of protein when compared with groundnut cake. In raising *A. achatina* hatchlings diet of 25% or 20% crude protein content could be supplied to the hatchlings for optimal growth. However, the poor growth performance of the *A. achatina* hatchlings fed on 15% crude protein diet may not be recommended for optimal growth of *A. achatina* hatchlings under captive rearing.

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Table 1: Composition of compounded feeds (g/100 g).

Treatments Ingredient	I	II	III
Groundnut cake (48%)	4.00	----------	12.00
Soyabean cake (45%)	--------	10.00	---------
Blood meal (80%)	7.00	16.00	18.00
Brewer's waste (18%)	10.00	7.00	---------
PalmKernel cake(18%)	-------	---------	11.00
Yellow maize (9%)	60.00	50.00	40. 00
Oyster shell	8.00	-------	--------
Bone meal	--------	6.00	8.00
Palm oil	5.00	5.00	5.00
Vitamin Premix	6.00	6.00	6.00
Total	100.00	100.00	100.00

Table 2: EFFECT OF DIFFERENT COMPOUNDED FEED ON THE BODY WEIGHT, SHELL LENGTH, SHELL WIDTH OF *A. ACHATINA* HATCHLING.

Parameters	I	II	III
Average initial weight (g)	5.6^{a}	4.8^{a}	5.1^{a}
Average final weight(g)	24.8^{a}	40.3^{b}	42.7^{b}
Average daily weight gain	0.3	0.5	0.56
Mean weight gain (g)	19.2	35.5	36.6
Mean initial shell length (cm)	2.6^{a}	2.8^{a}	2.7^{a}
Mean final shell length (cm)	4.3^{b}	5.4^{c}	5.6^{c}
Mean initial shell width (cm)	1.9^{a}	1.8^{a}	1.7^{a}
Mean final shell width (cm) 3	3.0^{a}	3.4^{b}	3.6^{b}
Survival (%)	100.0	100.0	100.0

Figures in the same row having the same superscript (a, b) are not significantly different ($p>0.05$) Mean daily weight gain = mean weight gain / number of the experimental days

Shell of *Archatina achatina*