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ISSN: 2332- 0206
Am. J. Life. Sci. Res.
Vol. 1, Issue 3, 129-135, 2013
American Journal of Life Science Researches
www.diili.org

Effects of Housing Types on the Growth Performance of Snail (Achatina achatina)

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Abstract: This research investigated the influence of housing types on growth performance of snail (Achatina achatina). Ninety (90) juvenile snails were used and thirty (30) snails each were subjected to each of the three housing treatments in replicates of 15 snails per replicate. The housing treatments had the same dimensions (120cm x 60cm x 30cm) and were labeled: Treatment A (Hutch box), Treatment B (Trench pen) and Treatment C (Mini-paddock pen). The housing treatments and its surroundings were fitted with a digital thermometer and hygrometer to take daily readings of internal and ambient temperature and humidity. The snails in each replicate were fed daily rations of 60g of dry Guinea corn bran, 50g ground egg shell and water was also supplied. The growth parameters investigated were: weight gain, shell length increase and shell circumference increase. Treatment C produced the highest yield in all the growth parameters for Achatina achatina and the means of the weight gain and shell circumference were statistically significant ($P < 0.05$) at 3, 6 and 9 months. The means of the shell length increase were not significant ($P > 0.05$) at 3, 6 and 9 months. Treatment C proved to be the best housing type for the production of snail and the study recommends that it be used as nursery, growing and fattening pens for rearing Achatina achatina in the tropics to produce best result.
Keywords: Achatina Achatina, Snail, Housing, Growth

INTRODUCTION

The protein deficiency in the diet of most developing countries is a cause for serious concern. The alarming increase in population implies that many people require the supply of protein in their diets because of its important role in human wellbeing which includes growth, maintenance of hormonal and enzymatic activities and improvement of the defense mechanism of the body[1].

Most of the conventional animal protein sources like beef, goat, pork and mutton have become too expensive for an average citizen. These major sources are being decreased by persistent drought, diseases, high cost of feed, primitive animal husbandry techniques and low productivity of local animal breeds. In order to provide a cheaper source of animal protein for consumption there is need for intensive system of rearing snails instead of gathering snails from the bushes. It has been observed that snails collected from the wild cannot meet man's demand as a source of animal's protein. Hence there is need to rear them on household and commercial basis[2]. Different breeds of snails are found in Nigeria and they are

characterized by their best efficiency of nutrient transformation into quality protein[2].

Besides the high protein content of snail meat, it is also low in cholesterol compared to other protein sources like poultry and pigs[2]. Snail meat is recommended for patients with highpertension and heart attack. The shells can be used for Ornamental purposes and also as a source of calcium and phosphorous in mixing rations for animals. Snail meat contains anti-tuberculosis qualities.

Pig and poultry have the disadvantage of competing directly with man for the scarce feeds but snails have been maintained on locally available materials including vegetable waste hence, they are cheap to maintain[3].

Temperature and humidity are the chief environmental factors that are known to influence growth performance[4] and reproduction in snails[5]. Different housing conditions have different effects on the modification of their internal temperature and humidity with respect to that of their surrounding[6]. Researches on snail production in the past have concentrated on aspects of nutrition and environmental factors but no researcher has tried to access the effect of different housing conditions on performance of snails with respect to the modified temperature and humidity of the houses, hence the relevance of this work. It is therefore important to understand optimal housing conditions for snail production in order to conserve snails hence, the need for this study.

MATERIALS AND METHODS

Study area

The study was carried out in MOGBO's Farm in Amawbia in Awka South Local Government Area, Anambra State of Nigeria. Amawbia is a town located between latitude 60N and 70N and longitude 70N and 80N. Ecologically, it lies in the Guinea savanna experiencing an annual rainfall of 1000mm – 1500mm with two seasons – the dry and rainy season.

The farm had an area of 105m2 (15m x 7m) and each of the housing treatments were placed in roofed enclosures and protected from direct rain and sunlight. Each enclosure was roofed with aluminum roofing sheets and padded with ceiling. There were plantain trees and rich vegetation around the farm to minimize wind effect. This was done to improve the microclimate of the snails as recommended by Cobbinah et al. [7]. The Intensive system of snail farming was used and the snails were provided with food and water in a closed system throughout the study period.

Experimental design

Ninety juvenile Achatina achatina snails were used for the study and they were subjected to three different housing types each with dimensions (120cm x 60cm x 30cm) in replicates of 15 snails per replicate; this is in line with the standard stocking density proposed by Cobbinah et al. [7]. The housing treatments were

labeled thus: Hutch box (Treatment A), Trench pen (Treatment B) and Mini – Paddock Pen (Treatment C). The housing treatments were each filled with soil rich in humus to a depth of 10cm to serve as bedding material and provide a soft substrate for the snails. The soil was changed every 3 months to prevent over fouling by snail droppings and mucus secretions. Each housing treatment and its surrounding were fitted with a digital thermometer and hygrometer to take daily temperature and humidity readings and the battery of the instrument was replaced every two months .

The snails in all the treatments were subjected to the same management conditions: they were fed daily rations of 60g Guinea corn bran, they were provided with humus soil to a depth of 10cm and were fed 50g of ground egg shell as calcium source to ensure shell length and same amount of water (0.75 liter) was sprinkled daily to increase humidity and prevent hibernation as done by Agbogidi[8]. Fresh water was also supplied .

Data collection

The growth indices data collected were: weight gain, shell length increase and shell circumference increase. The means of the growth indices were statistically analyzed with ANOVA and where significant, means were separated with the LSD value.

RESULTS

Growth performance of the snails

The growth indices of the snails throughout the study period are presented in tables 1, 2 and 3 (Appendix). The ANOVA tables for all the growth indices are presented in tables 1, 2 and 3 below.

Table 1. ANOVA of weight gain of snails at 3, 6 and 9 months as influenced by house types

House type	Mean wt at 3 months (g)	Mean wt at 6 months (g)	Mean wt at 9 months (g)
A	22.8± 2.83	45.7± 5.73	68.4± 8.49
B	29.2± 4.88	58.4± 9.83	87.4± 14.92
C	18.7± 2.40	37.5± 4.60	55.8± 6.86
F.pr	0.031	0.033	0.035
LSD	5.695	11.85	18.34

There was a significant difference in the weight gain of Achatina achatina at 3, 6 and 9 month's interval (table 1). Treatment C which yielded the best performance in terms of weight gain was found to be statistically different from Treatment B but statistically the same with treatment A at 3, 6 and 9 months interval.

Table2. ANOVA of shell length increase of snails at 3, 6 and 9 months as influenced by house types

House type	Mean sl at 3 months (cm)	Mean sl at 6 months (cm)	Mean sl at 9 months (cm)
A	1.485 ± 0.05	3.010 ± 0.18	4.500 ± 0.26
B	1.595 ± 0.01	3.240 ± 0.00	4.695 ± 0.01
C	1.550 ± 0.04	3.100 ± 0.18	4.465 ± 0.18

F.pr	0.134	0.242	0.370
LSD	Ns	Ns	Ns

There was no significant difference (P >0.05) in the average shell length increase of the snails subjected to the housing treatments at 3, 6 and 9 months interval.

Table 3. ANOVA of shell circumference increase of snails at 3, 6 and 9 months as influenced by house types

House type	Mean sc at 3 months (cm)	Mean sc at 6 months (cm)	Mean sc at 9 months (cm)
A	3.400 ± 0.01	6.845 ± 0.01	8.265 ± 0.01
B	3.595 ± 0.02	7.195 ± 0.01	9.800 ± 0.01
C	3.450 ± 0.04	6.900 ± 0.09	8.335 ± 0.11
F.pr	0.047	0.028	0.002
LSD	0.1372	0.1932	0.2376

There was a significant difference (P < 0.05) in the means of the shell circumference increase of the snails subjected to the housing treatments at 3, 6 and 9 months interval (Table 3). In the separation of the means with the LSD value, treatment C was found to be statistically different from Treatment B but statistically the same with treatment A at 3, 6 and 9 months interval. Treatment A was also found to be statistically different from treatment B.

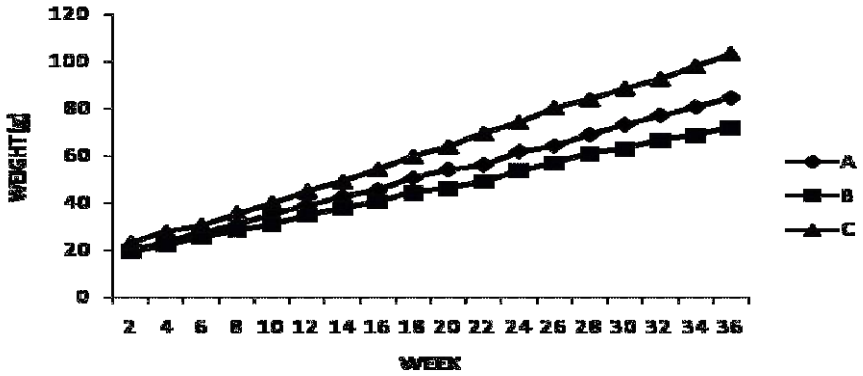

Fig 1. Bi weekly weight gain of Achatina achatina

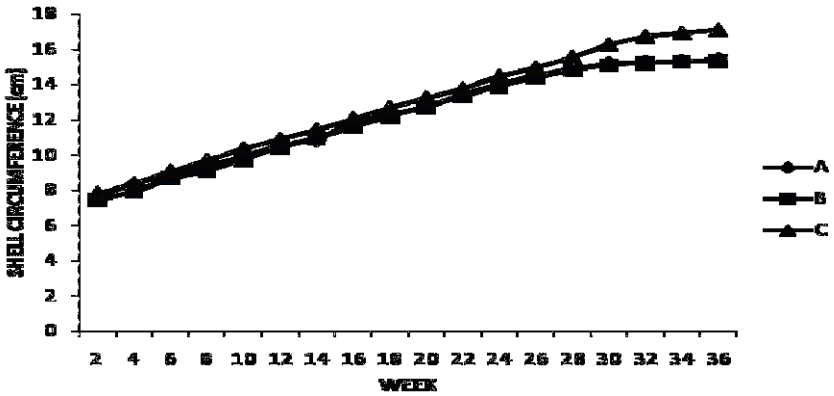

Fig 2. Shell circumference of Achatina achatina.

The average temperature and humidity readings taken throughout the study period as well as their variations are presented in tables 7 and 8 respectively.

Table4. Average maximum and minimum temperatures in the housing treatments, environment and temperature variation

Treatments	Min. average temp (C°) (a)	Max. average temp (C°) (b)	Min. average ambient temp (C°)	Max. average ambient temp (C°)	Temp variation (b – a)
A	23.0	29.0	22.6	31.5	6.0
B	22.4	29.3	22.6	31.5	6.9
C	22.7	27.6	22.6	31.5	4.9

Table 5. Average maximum and minimum humidity in the housing treatments, environment and humidity variation

Treatments	Min. average humidity (%) (a)	Max. Average humidity (%) (b)	Min. average ambient humidity (%)	Max. Average ambient humidity (%)	Humidity variation (b – a)
A	75.5	90.3	73	89	14.8
B	76.1	92.0	73	89	15.9
C	75.6	90.1	73	89	14.5

Cost of Construction of the housing types

The cost of construction of the three different housing types is presented in table 9 below

Table 6. Cost of construction of the housing treatments

S/n	Housing type	Unit price	Quantity price (x2)
1	Hutch box (A)	₦ 3850	₦ 7700
2	Raised Trench pen (B)	₦ 3865	₦ 7730
3	Mini-paddock pen (C)	₦ 3575	₦ 7150

N = Nigerian naira

DISCUSSION

The highest weight gain was recorded for snails housed in treatment C while the least weight gain was recorded for treatment B. (tables 1). Treatment C which gave the best result was found to be statistically different from treatment B, which gave the least result and statistically the same with treatment A. The implication however is that both treatment C and A could be used in rearing Achatina achatina to produce optimum yield. Since the means were significantly different at 3 months, it implies that Treatment C can also be used as nursery pens for Achatina achatina to produce best performance. It can also be used as fattening pens since the difference in means are significant at 6 and 9 months and Achatina achatina reach maturity about same time[7] .

The high yield of treatment C for Achatina achatina could be attributed to a number of factors: The type of material used for the construction of treatment C (Wire gauze and nylon mesh) could be responsible for its high yield; Treatment C was well aerated and allowed for cross ventilation of air thereby ensuring a more stable microclimate. Water could also easily drain off ensuring that the soil is not waterlogged. A study on the thermal performance of different building materials by Soofia et al., [6] reported that different materials have different effects on their modified internal temperature and humidity when compared to that of the environment. The modified internal temperature and humidity of treatment C proved to be best for snail production in the tropics.

In the case of shell length increase, there was no significant difference in the means of Achatina achatina though treatment C had numerical difference which could have occurred by chance. There was however a statistical difference in the means of the shell circumference increase of Achatina achatina subjected to the three treatments. The difference in the means at 3, 6 and 9 months shows that treatment C could also be used as both nursery and fattening pens to improve the growth of Achatina achatina in the tropics7. The high yield of treatment C could also be as a result of the material from which it was made (Chicken mesh and mosquito net) which brought about its modified internal temperature and humidity as evident in the temperature and humidity variation readings (table 3 and 4) and this conforms with the work of Soofia et al., [6]. This also implies that the micro climate provided by treatment C is also very favorable to the snails.

The Mini-paddock pen (Treatment C) was the cheapest house in terms of cost of construction (Table 6); its low price relative to other housing types could be attributed to the type of material from which it was constructed from. Wire gauze and nylon mesh are cheap materials compared to wood and sand Crete blocks that were used to construct Treatment A and Treatment B respectively. The implication of this however is that the use of Mini-paddock pen (Treatment C) for snail production in the tropics will be cost effective since it will maximize profit and still produce the best yield.

This research has provided another insight to enhancing better growth performance in snails. This however will boost the supply of animal protein among the populace to support the already handicapped protein supply. The study concludes that Housing has a significant influence on weight gain and shell circumference of Achatina achatina and Treatment C (Mini – paddock pen) is the best for the production of Achatina achatina and could be used as nursery pens and fattening pens to produce best result.

ACKNOWLEDGEMENT

The author wish to acknowledge Professor Anizoba Margaret Azuka for supervising this research work and Osadebe Nwanneka for assistance in data collection.

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