GROWTH PERFORMANCE OF GIANT AFRICAN LAND SNAIL (*Archachatina marginata*) JUVENILES REARED ON DIFFERENT ENCLOSURE MEDIA

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R. O. Adewale[1]*, B. R. Odebiyi[1] and A. A. Yusuf[2]
[1]Department of Forestry, Wildlife & Fisheries, Olabisi Onabanjo University, PMB 0012, Ayetoro Campus, Ogun State, Nigeria
[2]Department of Forestry and Wildlife, Bayero University Kano, Kano State, Nigeria
*Corresponding author: adewale.rilwan@oouagoiwoye.edu.ng

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Abstract: Land snails are known to have strong association with soil, serving as an important part of their ecosystem. Several researches had seldom been conducted on the performance of giant African land snails (GALs) in relation to environment that lack soil. This probably may be due to the mere fact that no bases for their separation (soil and snail) reasonably seem to be justifiable. However, with increasing soil pollution, prevalent in our society, there may be need to rear snails in a non-soil media, especially where no good soil exist. This study aimed at determining the performance of GALs reared on different enclosure media. The duration of the experiments was 56 days during which the growth performance of 24 juvenile snails (*A. marginata*) divided into 8 units of identical baskets (4 snails/basket) were studied on different media; soil containing medium (SCM) and non-soil containing medium (NCM) acting as control (3 baskets/Treatment). The result indicated a significant difference ($P<0.05$) in GALs present inSCM with a total mean body weight gain of 24.25 g and a daily body weight gain of 0.43 g thereby indicating a better growth performance than that of GALs in NCM, which had a total mean body weight gain of 6.05 g and a daily body weight gain of 0.11 g. Though, GALs in both media showed no significant difference ($P>0.05$) in the growth performance of the length and width. The result therefore indicated that GALs may not grow well in the absent of soil media.

Keywords: Giant African land snails, growth, media, performance

Introduction

Giant African land snails (GALs) are cold blooded animals belonging to the phylum *mollusca* .It is an invertebrate animal with a soft body carrying a hard shell. They are naturally found in the forest, swampy area and cities close to forest and mostly hunted during the raining season (Cobbina *et al*., 2008). Numerous GALs exist but Ejidike (2004) affirmed that the commonly found land snail species in West Africa are; *Achatinaachatina*, *Achatinafulica* and *Archachatina marginata*, of which the later one is the generallyembraced species in Nigeria. Apart from snail being a delicacy meat to Africans, it also serves as a good source of animal protein (Ejidike, 2016). According to USDA (2006), snail meat is nutritious; rich in protein and iron but low in fat. Ademolu *et al*. (2004) reported that indiscriminate hunting and deforestation had negatively impacted the snail habitat and subsequently caused the present rarity of GALs. This challenge is not limited to Nigeria alone, many scientific researchers had documented similar occurrence in other part of the world especially here in Africa. Therefore, further researches become necessary, not only to satisfy the current demand of the snail meat but also to ensure the survival of the species. Aside the challenge of the feed in the domestication of snail, water and good soil are another important components required for optimum growth performance of GALs. The soil provides snail with water, calcium, organic matter and serves as a medium through which the snail incubates their eggs and repose during unfavourable condition (Cobbina *et al*., 2008).

According to Nyoagbe *et al*. (2016), snail sometimes contains parasites and pathogens owing to their habitat (swamps and marches) which permanently remain and are difficult to get rid of. Wild snails are prone to microbial contamination because of their unavoidable association with soil and uninfluenced pattern of feeding (Nyoagbe *et al*., 2016). He further argued that the snail meat gotten from such soil is likely to have been contaminated by various pathogens and hence act as vector to consumers. Majority of these consumers, if not all, are not aware of this fact. The case is complicated if snails are not processed very well before consumption. Despite the fact that snails have been known to have great performance when reared in media containing soil, far less is known about these animals in regards to their performance when reared in a non-soil media. The aim of this experiment was to study the growth performance of snail (*Archachatina marginata*) on two media (soil and non-soil media), to know whether snail could be reared without soil.

Materials and Methods

Study area

This experiment was undertaken in the wildlife domestication unit, Department of Wildlife and Ecotourism, Federal University of Technology Akure (FUTA) during the raining season (favourable condition for snails). Twenty four (24) healthy juvenile snails and four (4) experimental baskets (made of plastic), each of volume (2 x 22/7 x 18 x 25 = 2,828.57 cm^3) perforated to allow air and excessive water to drain easily (to prevent water logging) were obtained from Owena market at Ifedore Local Government of Ondo State for the experiment. The baskets were placed on top of the table having their legs placed in water containing black oil to prevent attack of insects. The snails were quarantined for 5 days before randomly allotted to two media; soil containing medium (SCM) and non-soil containing medium (NCM). Three of the six baskets contained damp humus soil filled to about 5 cm depth (Treatment I) while the other three baskets contained no soil (Treatment II- control). Each Treatment comprise of twelve snails, replicated three timeswith four snails per replicate in a complete randomized design. Various freshly harvested feed (*Talinum triangulare, Amaranthus spp, Carica papaya* (leave and fruit), cocoyam leave, *Xanthosoma spp*) were fed to them once every day. Calcium powder was sprinkled over the feed for the snail to eat, each time they were fed. The basket was inspected and cleaned everyday by removing the remnant feed, mucus and faeces before daily feeding. In addition, the SCM was raked everyday for proper mixture of the soil. Apart from the provision of water by wetting the baskets every morning to keep the environment moist, feed and water (in a shallow container) were also given *ad libitum*.

The experiment lasted for a period of 56 days (8 weeks). Weekly measurement of the weight, shell length and width

(with triple beam balance, veneer caliper and ruler) of each of the snails were determined and recorded appropriately to determine the growth performance of the snails under the two different media. After 56 days, four snails were selected from each Treatment for carcass analysis. Alldata were subjected to analysis of variance (ANOVA) and different in mean values were compared using LSD test while AOAC (1990) methods were used to determine the proximate and chemical analysis of snail samples from each media.

Results and Discussion

It is a known fact that for an animal to increase in size and weight, its basic requirements such as food and suitable environment among others, must be met. However, where the environment in which the organism lives is threatened and constitute detrimental effect to the health of the consumers of the organism, an alternative environment must be sought for, not only for the animal to remain in existence but also to pose less danger to the consumers of such animal. The results obtained for the growth performance of the juvenile GALs reared on different media are summarized in Tables 1 – 3 and Figs. 1 – 2.

Table 1 represents the proximate chemical composition of the experimental juvenile snails with no significant difference in both treatments. However, the GALs in SCM have significant higher mean values in terms of mineral constituents than those in NCM (Table 2). This indicated that snails in SCM might seem nutritiously more beneficial to consumers than those of NCM.

Table 1: Proximate chemical composition of the experimental juvenile snail

Parameters (%)	Initial	Treatment I	Treatment II
Moisture	5.69	3.02	4.20
Crude protein	30.20	56.28	55.22
Fat	5.89	19.41	18.36
Fiber	ND	ND	ND
Ash	3.50	5.71	7.02
NFE	54.54	13.58	15.21

ND = Not Determined; NFE = Nitrogen Free Extract

Table 2: Proximate mineral composition (mg/kg) of the experimental juvenile snail

Treatment	Zn	Na	Cu	Mn	Fe	Mg	K	Ca
Treatment I	19.40	46.73	0.073	0.72	16.84	99.48	59.91	35.89
Treatment II	6.96	20.69	0.03	0.27	8.37	25.59	30.38	20.84

Table 3: Growth performance of the experimental juvenile snail

Parameter	Treatment I	Treatment II
Initial mean weight (g)	49.62	50.60
Final mean weight (g)	73.87[a]	56.65[b]
Mean weight gain (g)	24.25[a]	6.05[b]
Daily weight gain (g)	0.43[a]	0.11[b]
Initial mean shell length (cm)	6.88	7.01
Final mean shell length (cm)	7.88[a]	7.96[a]
Mean shell length (cm)	1.00[a]	0.95[a]
Initial mean shell width (cm)	4.68	4.30
Final mean shell width (cm)	4.97[a]	5.11[a]
Mean shell width (cm)	0.29[a]	0.81[a]
Mortality (%)	0.00	0.00

[a,b] = means followed by the same superscript on the same row are not significantly difference (P>0.05).

The result (Table 3) revealed that there was a significant difference (P< 0.05) in the mean body weight gain of the snails in the two treatments, as the snails responded well to Treatment I (SCM) with a greater total weight gain (24.25 g) and a daily body weight gain (0.43 g) than the snails in Treatment II (NCM) which had a total mean body weight gain of 6.05 g and a daily body weight gain of 0.11 g. This indicated that snails in treatment I showed a better growth performance than snails in Treatment II. This might be due to the fact that, soil is the natural habitat of land snail on which the land snails equally fed (Hodasi, 1984). Moreover, better growth performance of the GALs in SCM may be due to the water retention capacity of the soil which aid in maintaining the enclosure humidity. This is in agreement with the report of Ejidike (2004) that snail species generally prefer a humid environment for survival and normal functioning. However, the relatively poor growth performance of *A. marginata* reared in enclosure without soil (Treatment II) might be due to the fact that the GALs were deprived of the nutrient which could have been obtained from the soil, as they only depended on the nutrient from the food supplied alone.

Also, it was observed that the juvenile GALs in SCM constantly gained body weight throughout the experimental period (Fig. 1), while GALs in NCM decreased in body weight at the third (3rd) week before increasing (Fig. 2). On the other hand, it appears that both shell length and width of the experimental snails were not affected by the different enclosure media. This supports the statement of Cobbina *et al*. (2008) affirming that the growth performance of snail largely depends on the availability of good soil with adequate nutrition, lack of which may cause fragile shell.

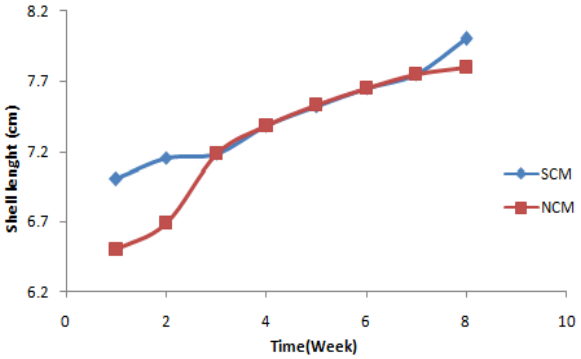

Fig. 1: Mean shell length increase of juvenile *Archachatina marginata*/week

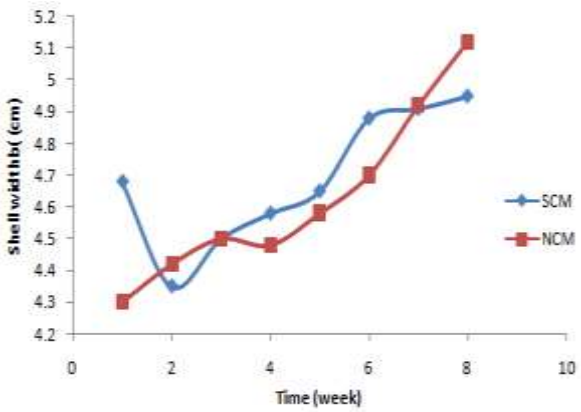

Fig. 2: Mean shell width increase of juvenile *Archachatina marginata*/week

However, a well formulated or compounded feed in combination with regular wetting of snail environment may go a long way to prevent this defect since it will contain all the nutritional requirement of the snail. Ejidike (2004) ascertained that, recently in Nigeria, various studies have exemplified the response of *A. marginata* on compounded feed in order to provide optimum growth rate as well as dependable year round of snail farming. Farmers willing to embark on snail farming in areas with polluted land will be happy to farm snail with compounded feed, which might seemingly help to ameliorate the defect of rearing snails without soil. In another study, Ejidike (2007) stated that successful use of artificial diet might stimulate interest and increase the number of farmers that would invest on *A. marginata* in West Africa. In addition, hundred percent (100%) survival of the GALs were recorded in both Treatments.

Conclusion

The study revealed that the GALs grown on soil-media did better in terms of their body weight than those reared on a medium without soil. Hence, to have a positive growth performance of snails, having a good soil (without contamination) appeared to be a very important factor in snail farming. Unless or otherwise the snails diets is not restricted to wild diet but supplemented with compounded feed that are very rich in snails required nutrients. Future studies should therefore investigate the growth performance of GALs fed with a compounded feed in a non-soil media.

Conflict of Interest

Authors declare that there is no conflict of interest reported in this work.

References

Ademolu KO, Idowu AB & Osinowo AO 2004. Performance, proximate and mineral analysis of African giant land snail (*Achatina achatina*) fed different nitrogen sources. *Afr. J. Biotech.*, 3(8): 412-417.

AOAC 1990. Association of Official Analytical Chemist (Ed. W Horwitz). 13th Edition, Washington, DC.

Cobbinah JR, Vink A & Onww B 2008. Snail Farming in West Africa. Snail Farming: Production, Processing and Marketing. Agrodok 47, Agromisa Foundation. Wageningen. The Netherland, pp. 25-26.

Ejidike BN 2004. Observations on the dietary protein level on maturity and egg production of the African giant land snail, *Archachatina marginata*. *J. Ani. Veterinary Adv. Pak.*, 3: 510-513.

Ejidike BN 2007. Influence of artificial diet on captive rearing of African giant land snail, *Archachatina marginata* Pulmonata; Stylommatophora. *J. Ani. and Veterinary Adv.*, 6(8): 1028-1030.

Ejidike B N 2016. Growth response of African giant land snail *Archachatina marginata* fed on single plant leaves or the leaves supplemented with diet of 25% crude protein. Int. *J. Curr. Microbio. App. Sci.*, 5(5): 934-939.

Hodasi JK 1984. Some observations on edible giant land snails of West Africa. *World Anima Review*, 52: 24-28.

Nyoagbe LA, Applah V, Nketsia-Tabir J, Larbi D, Adjei I 2016. Evaluation of African giant snail (*Achatina* and *Archachatina*) obtained from markets (wild) and breeding farms. *Afr. J. Food Sci.*, 10(7): 94-104.

USDA 2006. National Nutrient Standard Reference. Available at: http://www.ars.usda.gov/Services/doc.htm?docid=1597