African Journal of Agricultural Research Vol. 6(21), pp. 4968-4972, 5 October, 2011
Available online at http://www.academicjournals.org/AJAR
DOI: 10.5897/AJAR11.623
ISSN 1991-637X ©2011 Academic Journals

Full Length Research Paper

Evaluation of growth and body traits of snailets obtained from the crossbreeding of black skinned × white skinned snails (*Archachatina marginata* (S)) in the Niger Delta area of Nigeria

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Accepted 22 August, 2011

This study evaluated the growth and body traits of snailets or juveniles obtained from the hatching of eggs resulting from the crossbreeding of black skinned × white skinned snails. The indices used were body weight, shell length, shell width, 'mouth' length and 'mouth' width. The results showed that all measured traits expressed progressive increase from hatch to week four. However, the differences observed among the mating groups for these traits were not significantly different. The results also showed that the product of the crossing was a mixture of black and white skinned snailets. This further confirms the possibility of mating between the black and white skinned snails. Interested snail farmers are encouraged to rear both black and white skinned snails.

Key words: Crossbreeding, growth, Niger Delta, snails, economic traits.

INTRODUCTION

Nigeria's first Free Trade Zone (FTZ), Africa's first Business Resort (TINAPA) and the Obudu Ranch Resort had been created in Calabar and Obudu areas of Cross River State by the government. Cross River State is one of the states that constitute the Niger Delta region of Nigeria. The FTZ, TINAPA and Obudu Ranch Resort attract many tourists to Cross River State. These business ventures have made the Cross River State's economy perhaps the fastest growing in the country today, resulting in increased numbers of people. This increases demand on the few animal protein sources further and the need to search for novel animal protein sources. Ibom et al. (2008) and Ibom (2009) stated that the domestication of wildlife species such as snails, cane rats and giant rats may offer a solution to the need to improve the level of animal protein production in Nigeria.

Snails play a very important role in the economy of rural families where they serve as a source of animal protein. Over the years, snails used by man as food were harvested from the wild. The growing popularity of snails as meat source among Nigerians and people of other nationalities necessitates investigation of their productivity. Snails are one of the important minor forest products being domesticated as micro-livestock and are traditionally and socially accepted in most rural and urban settings in Africa. They serve as a good source of revenue and animal protein. These days they are reared by farmers, individuals, government and non-governmental organizations for commercial purposes. However, the problem of suitable foundation stock for commercial/large scale snail production remains to be addressed. This corroborates Ibom's (2009) position that suitable snail species for commercial production are lacking because the business is relatively new.

There is need to evaluate the growth performance of snailets, since growth in terms of body weight gain and shell increments (length and width) are the most widely used growth indices for snails from hatching to maturity. Body weight according to Fitzhurgh (1976) has been used by both local sellers/buyers and researchers as a

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Table 1. Mating arrangement of the grower snails.

Mating group	Number of snails	Number of cells
Treatment I	2	10
Treatment II	2	10
Treatment III	2	10

Plate 1. A replicate of the mating pairs.

parameter for selection. To promote the domestication and massive production of snail species to complement the conventional animals as sources of animal protein supply demands knowledge of phenotypic traits like weight, weight gain, shell length, shell width, 'mouth' length and 'mouth' width. The growth of these traits is obviously influenced by such factors as genetic constitution, nutrition, disease and hormonal make up of a particular animal. This lays credence to why growth rate of snails varies considerably between individuals in a given population or group.

MATERIALS AND METHODS

This study was conducted at the Snailery Unit, Department of Animal Science Teaching and Research Farm, Cross River University of Technology (CRUTECH), Obubra Campus. The location, annual rainfall and temperature of Obubra are described by Ibom et al. (2008) and Ibom (2009). The area where this research was conducted provided a mini-environment similar to the natural habitat of snails because the area is planted with plantation trees such as gmelina and teak. It also has an undergrowth of wild shrubs. These plants provided the shade that protects the parent snails and snailets from direct sunlight and heavy rainfall.

Sixty (60) grower snails, thirty each of the black skinned and white skinned ectotypes were randomly allotted into three treatments (mating groups) on the basis of body weight ranges. The body weight ranges were 31.11 to 33.47 g for both ectotypes. They were replicated ten times and raised for three months (May to July). Two snails were placed in each cell/cage per replicate for reproduction. Each snail was marked for easy identification. The mating arrangement is shown on Table 1, while Plate 1 shows a replicate pair of the mating groups.

The snails were fed on a mixed feeding regime of formulated diet and forage (pawpaw leaves). They were fed an average of 10 g of

Table 2. Mean weekly weights (g) ±SE of snailets or juveniles obtained from the crossbreeding of BS X WS snails.

	Mating groups		
Age (weeks)	**Group I**	**Group II**	**Group III**
At hatch	0.68 ± 0.08	0.69 ± 0.03	0.68 ± 0.05
1	0.98 ± 0.08	0.96 ± 0.03	0.99 ± 0.04
2	1.30 ± 0.08	1.31 ± 0.02	1.33 ± 0.05
3	1.69 ± 0.11	1.70 ± 0.15	1.68 ± 0.12
4	2.08 ± 0.14	2.01 ± 0.18	2.05 ± 0.16

the formulated diet and 15 g of pawpaw leaves per head, once daily at 5 to 7 pm. Water in shallow troughs was also given at the same time.

The ectotypes of giant African land snails are differentiated on the basis of their "foot" colour, which is usually black or white. Besides, the white skinned ectotypes of *A. marginata* are naturally smaller in size than the black skinned ectotypes.

Snailets or juveniles obtained from the hatching of eggs laid by the snails were raised for four weeks to assess their growth rate using growth and body indices. The indices measured include body weight, shell length, shell width, 'mouth' length and 'mouth' width. Body weight (g) was measured using electronic weighing scale with a sensitivity of 0.01 g while shell length (mm), shell width (mm), 'mouth' length (mm) and 'mouth' width (mm) were measured using Vernier Caliper.

RESULTS AND DISCUSSION

The results of growth and body traits (indices) measured on snailets (hatchlings or juveniles) in this study are presented on Table 2. The results showed that mean weight at hatch (the first indicator of hatchlings growth rate) which was used as a starting point for measurement were 0.68 ± 0.08 g, 0.69 ± 0.03 g and 0.68 ± 0.05 g respectively for snailets of the three mating groups. Subsequent growth was measured from weight at hatch and corroborates the position of Ibom (2009). The author further stated that other indices that can be taken at hatch and used to measure subsequent snail growth are body parameters (shell length, shell width and shell thickness) and aperture (shell "mouth") parameters (shell "mouth" length and shell "mouth" width).

The mean weekly body weight results of this study (Table 2) showed that growth in terms of weight gain is generally low/slow during the first few weeks of life after hatch. This could be because juvenile snails eat little or no feed (concentrate and/or forage) during this stage of life. Their survival according to Ibom (2009) depends mostly on body reserves (residual yolk, glycogen and muscle protein), egg content leftover and soil as they harden up and become familiar with the new environment outside the egg shell or embryonic environment. The slow rate of weight gain could also be attributed to the non-provision of maternal protection by parent snails to their babies (snailets or juveniles). However, when the juveniles are fully accustomed to the natural environment, they consume appreciable quantity of feed and consequently attain substantial progressive weight increase during the period (Table 2). The numerical differences observed among mating groups in this study were not statistically significant ($p > 0.05$). The non significant difference expressed by the snailets of these mating groups could be an indication that the parent snails used were within close size brackets and is in line with the results of Omole and Kehinde (2005) who found a positive correlation between the size of the snail and the hatchling(s) produced.

Other indices (shell length, shell width, "mouth" length and "mouth" width) taken at hatch and used for the measurement of subsequent growth of snailets are presented on Table 3. The results of these indices showed that there were numerical variations among the mating groups. The numerical variations were not significantly different ($p > 0.05$), following the trend of weights among the groups. The non significant differences expressed by the snailets for these traits among the mating groups can also be attributed to the close size brackets of parent snails used. The expression of non significant differences among the traits evaluated in this study has further confirmed that there is a positive correlation between parent snail size and the snailets produced.

Plate 2 shows some hatchlings from a clutch of the mating pairs. The picture displayed reveals that some of the snailets were black while others were white in colour. This result is in line with the findings of Ibom (2009) and Okon et al. (2009, 2010). It could be inferred that the gene for black colour (pigmentation) was dominant over the gene for white pigment in this clutch. This is because the black skinned snailets out numbered the white skinned snailets.

Conclusion

The results of this study showed that the variations among traits of the three mating groups studied were not significantly different. There was encouraging growth performance from the snailets and therefore intending snail farmers are encouraged to employ crossbreeding of the black and white skinned snails.

Table 3. Mean weekly body traits (mm) ±SE of snailets obtained from the crossbreeding of BS X WS snails.

	Group I				Group II				Group III			
Age (weeks)	**SL**	**SW**	**ML**	**MW**	**SL**	**SW**	**ML**	**MW**	**SL**	**SW**	**ML**	**MW**
At hatch	1.41±0.03	1.16±0.02	1.05±0.03	0.67±0.02	1.25±0.02	0.99±0.02	0.89±0.02	0.56±0.01	1.32±0.03	1.08±0.02	0.96±0.01	0.65±0.01
1	1.55±0.03	1.24±0.02	1.16±0.03	0.73±0.02	1.40±0.02	1.11±0.02	1.02±0.02	0.62±0.01	1.39±0.01	1.21±0.03	1.08±0.03	0.70±0.03
2	1.64±0.03	1.24±0.02	1.24±0.03	0.78±0.03	1.51±0.02	1.11±0.02	1.13±0.03	0.68±0.01	1.62±0.02	1.21±0.02	1.14±0.03	0.76±0.02
3	1.75±0.03	1.37±0.02	1.32±0.03	0.83±0.02	1.62±0.03	1.29±0.03	1.25±0.05	0.73±0.02	1.68±0.03	1.35±0.02	1.31±0.04	0.79±0.02
4	1.91±0.04	1.44±0.02	1.40±0.04	0.88±0.02	1.74±0.03	1.37±0.03	1.33±0.03	0.79±0.01	1.83±0.04	1.41±0.01	1.35±0.02	0.82±0.01

Plate 2. Snailets or hatchlings (juveniles) at hatch.

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