EFFECTS OF NATURAL AND COMPOUNDED RATIONS ON THE GROWTH PERFORMANCE OF AFRICAN GIANT LAND SNAIL (*ARCHACHATINA MARGINATA*)

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ABSTRACT

A study was conducted to compare growth and feed utilization of Archachatina marginata fed fluted pumpkin leaves (Telifaria occidentalis), 20% crude protein diets, cocoyam (Xanthosoma maffafa) leaves, or 25% crude protein diets (diets I, II, III and IV respectively) for 120 days. The performance of the Archachatina marginata was assessed on the basis of weight gain, shell length, shell aperture, shell width and feed utilization. The Archachatina marginata fed on the diets showed progressive increase in body weight with no significant difference (p>0.05) among the mean body weight at the end of 120 days. Increase in shell length, shell aperture and shell width were recorded in all the treatments. Each of these parameters (shell length, shell aperture, shell width) showed no significant differences (p>0.05) among the treatments. There was no significant difference (P>0.5) among the daily weight gain, protein efficiency ratio (PER), and food conversion ratio (FCR) of the snail on the treatments.

KeyWords: *Growth and feed utilization, Growth performance, African giant land snail, weight gain*

INTRODUCTION

In West Africa, the market supply of snails is mainly from the gatherers that hand picked them from their habitat in the wild, which is facing deforestation and degradation due to human activities. Little or no concrete measure towards snail management may result in drastic reduction in the supply of the animal in no distant future. Farming of snail has been in existence in other parts of the world long ago. It is a successful business in most European countries (Mead, 1981).

African giant land snail, being highly accepted as delicacy and widely utilized in traditional medicine in southern Nigeria (Agbelusi and Ejidike, 1992), needs to be farmed on commercial basis. As a matter of fact, large-scale snail farming of African giant land snail (*Archachatina marginata*) will pave way for it in international market as well as meeting people's demand for the snail in the local market thereby contributing to the protein intake of the populace. To sustain commercial farming of snails in West Africa, the need to source alternative cheap and available feed is necessary as most of the snail plant food materials are seasonal. Rearing snails on a continuous basis trespassing the rainy and dry seasons through good management practices need assurance of constant food supply. African giant land snail is found to be active under moist environment irrespective of the season (Ejidike and Omisade, 2007). This implies that adequate accepted snail food materials and damp environment are essential in the establishment

and management of snail farm. Having the necessary requirements would sustain and encourage the current surge of interest in snail farming practice all over Nigeria especially in southern area where 'backyard' snail farming is the order of the day despite the fact that land snails are non-conventional wildlife animal protein source (Adeyeye, 1996). The success of snail farming practices requires knowledge of harnessing low-cost agricultural by-products as well as its waste products in formulating snail feed for optimum yield. This study therefore, aims at assessing the effect of two compounded diets of different crude protein levels and two plant leaves of similar crude protein levels to the diets on survival, weight gain, shell length increase, shell aperture, shell width gain, nutrient utilization of African giant land snail (*Achachatina margitana*) under captive rearing.

MATERIALS AND METHODS

Sixty juvenile African giant land snails (mean weight 9.2±1.1) were obtained from the snail Pen of Teaching and Research Farm of Federal University of Technology, Akure. The snails were grouped into five snails per group and randomly allotted to each of the treatment replicates. The treatments were replicated three times using a complete randomized design. Each group of the snails was stocked into wooden cages (1m x 1m x 0.45m) each constructed of wood and chicken wire mesh. The wooden cages were filled with topsoil up to 15cm thickness and raised 10cm above the ground on four wooden legs. Treatment 1 was fluted pumpkin leaves, Treatment II was 20% crude protein ration, Treatment III was cocoyam leaves and Treatment IV was 25% crude protein ration. The plant leaves were obtained within the University crop farm and its vicinity and chopped into pieces before feeding it to the snails. The rations were formulated using locally available feedstuffs as shown in Table 1. Some of the feedstuffs (groundnut cake, yellow maize, brewer's waste) were purchased from poultry farm in Akure while red palm oil was purchased from red palm oil seller at Oja Oba market in Akure. Fresh blood was obtained from abattoir, boiled and sun-dried at temperature of 27 ^{o}C for three days and then milled to fine powder. Cocoa pod husks were obtain from a cocoa farmer sliced and sun-dried at temperature of 27^{o}C for five days and then milled to fine powder. The ingredients for 20% crude protein diet and 25% crude protein diet were separately mixed thoroughly according to the feed formulation and prepared using hot water for it to form paste and it was sun-dried at temperature of 27 ^{o}C for three days and then packed each into separate polyethylene bags for subsequent uses. The snails were fed at 2% body weight with their respective food once daily at 1800 hours for 120 days. Wetting of the snail enclosures with well water was done twice daily at 0700 hours and 1830 hours in order to keep the environment humid for the snails. The snails were weighed bi-weekly, and food adjusted accordingly with the weight gains. Proximate composition of the plant leaves and the compounded rations were determined using the standard AOAC (1990) methods. One-way analysis of variance (ANOVA) was carried out on the data obtained.

Table 1: Gross composition of the diets (g/100g)

Ingredients	20% crude protein diet	25% crude protein diet
Groundnut cake (48%)	7.53	10.94
Blood meal (80%)	12.51	18.22
Yellow maize (9%)	50.93	41.84
Brewer's waste (18%)	10.00	10.00
Cocoa pod husk (8.7%)	5.00	5.00
Bone Meal (11%)	3.00	3.00
Red palm oil	6.00	6.00
Vitamin premix	5.00	5.00

Note: Values in parentheses are percentage crude protein content of the ingredients.

RESULTS AND DISCUSSION

The proximate compositions of the experimental diets are shown in Table 2 while growth response, nutrient utilization and survival of the African giant land snail (*A. marginata*) fed on different natural plant leaves and artificial diets are shown in Table 3. There was no significant difference (P>0.05) among the mean weight gain, mean shell length increase, shell aperture increase and shell width increase of the African giant land snail fed on the diets and the plant leaves. From the body weight gains and increase in morphological parameters (shell length, width, aperture length) of the *A. marginata*, it could be stated that compounded diets from locally available feedstuffs compares favourably with farm plant leaves on the growth performance of African giant land snail (*A. marginata*). These increases in the body weight and all the morphological parameters of the snail in all the treatments indicates that compounded diets have potential of sustaining snail farming especially during scarcity of snail's natural plant food

These results were contrary to the report of Imevbore (1990) that significant difference (P<0.05) existed between young African giant land snail fed on plant leaves (green papaw leaves) and broiler grower's mash. Though the significant difference (P<0.05) reported by him might exist due to the differences in the crude protein of papaw leaves (18.95% crude protein wet weight basis) and those of the broiler grower's mash (14.85% crude protein dry weight basis) that are widely different from each other. Increase in the shell length, shell aperture length, shell width of the snails in all the treatments indicate that the plant leaves as well as the diets aid in the entire body growth of the snails. The morphological parameters of the snails in all the treatments were observed to increase proportional to their body weight proving the plant food materials and the diets are equally food for the animal.

The lower food conversion ratio recorded by the snails on diet IV and II (compounded diets) over the snails on the plant leaves though without significant difference (P>0.05) indicates that African giant land snail utilized the nutrients available in the 25% and 20% crude protein diets more efficiently. Comparatively, compounded diets have a good role to play in the farming of the snail all year round without facing scarcity of food during the dry period as against plant

leaves that are seasonal. Moreover, supplementing plant leaves with compounded diets produces high snail yield (Ejidike and Afolayan, 2000). Availability of acceptable snail feed could contribute a lot in encouraging recent interest in snail farming in Nigeria, thereby adding to the efforts towards eradication of the current acute animal protein shortage. Use of artificial diet in feeding snails will arouse the establishment of commercial farming of African giant land snail for constant supply to the market.

Snails fed compounded diets relatively retain more body protein than those on plant leaves. This might be due to the fact that available nutrients of the diets originate from different feedstuffs thereby making them more balanced. Relatively low body protein retention of the snails on cocoyam leaves (Table 4) agrees with the report of Imevbore (1990) that cocoyam leaves are relatively poorly utilized by *A. marginata*.

Incorporation and availability of low cost artificial diet in snail farming especially during the dry season would be useful in mass production of African giant land snail thereby reducing exorbitant price of snail during the period.

Table 2: Proximate composition of the experimental plant leaves and the diets (Dry weight basis) fed to the snails.

	Diet I	Diet II	Diet III	Diet V
Moisture	7.6	8.1	14.3	7.6
Crude protein	19.1	19.9	24.7	24.9
Lipid	14.3	3.8	10.7	3.7
Fiber	14.2	3.7	12.1	4.3
Ash	18.9	9.1	2.4	9.6

Table 3: Growth response and nutrient utilization of *A. marginata* fed plant leaves and diets

	Treatments			
	Diet I	**Diet II**	**Diet I II**	**Diet V**
Initial mean weight (g)	9.2+1.2[a]	9.2+1.1[a]	9.2+1.2[a]	9.2+1.2[a]
Final mean weight (g)	55.4+1.1[a]	59.5+1.8[a]	49.8+0.2[a]	63.6+1.4[a]
Mean weight gain (g)	46.4[2a]	50.3[a]	40.6[a]	54.4[a]
Initial mean shell length (cm)	3.6+0.2[a]	3.6+0.2[a]	3.6+0.2[a]	3.6+0.2[a]
Final mean shell length (cm)	7.0+0.2[a]	7.0+0.6[a]	6.5+0.2[a]	7.1+0.4[a]
Initial shell aperture length (cm)	2.7+0.2[a]	2.7+0.2[a]	2.7+0.2[a]	2.7+0.2[a]
Final shell aperture length (cm)	4. 9+0.2[a]	5.1+0.2[a]	4.9+0.2[a]	5.4+0.2[a]
Initial mean shell width (cm)	2.5+0.2[a]	2.5+0.2[a]	2.5+0.2[a]	2.6+0.2[a]

Final mean shell width (cm)	4.4±0.1[a]	4.4±0.3[a]	4.4±0.2[a]	4.6±0.2[a]
Feed intake (g)	345.6	334.1	299.2	345.0
Mortality (%)	0.0	0.0	0.0	0.0
Daily weight gain (DWG)[1]	1.9±0.2[a]	2.0±0.2[a]	1.7±0.2[a]	2.3±0.2[a]
Food conversion ratio (FCR)[2]	1.4±0.2[a]	1.3±0.2[a]	1.4±0.2[a]	1.2±0.2[a]
Protein efficiency ratio (PER)[3]	3.6±0.2[a]	3.8±0.2[a]	2.6±0.2[a]	3.1±0.2[a]

Figures in each column having the same superscript are insignificantly different (P>0.05)

1 DWG = total weight gain/number of the experimental days

2 FCR = feed intake/wet weight gain

3 PER = gain in weight of snail/protein consumed

Table 4 Proximate composition (%) of *A. Marginata* carcass fed diets or plant leaves

	Initial	Diet I	Diet II	Diet III	Diet V
Moisture	9.4	6.2	8.6	11.5	9.5
Crude protein	52.9	63.0	65.8	60.9	67.4
Ash	5.0	5.8	5.9	4.4	6.1
Fat	1.4	5.2	5.4	3.9	5.5

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