



GROWTH RESPONSE OF *Achatina achatina* (Linn.) AND *Archachatina marginata* (Swainson) AS INFLUENCED BY THREE VEGETABLE FEEDS

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ABSTRACT

An experiment was conducted in 2007 in Asaba, Delta State, Nigeria to evaluate the growth response of *Achatina achatina* and *Archachatina marginata* as influenced by three vegetable feeds: (*Amaranthus cruetus*, *Carica papaya* and *Talinum triangulare*) with a view to recommending to snail growers the best vegetable feed (s) suitable for the growth of land snails in Delta State in particular, and Nigeria as a whole. The results showed that weight of snails, length and width of the shell of snails fed with the three edible vegetables were significantly ($P \leq 0.05$) higher in *A. achatina* when compared with that of *A. marginata*. The study also indicated that snails fed on *T. triangulare* performed significantly better ($P \leq 0.05$) in terms of the weight as well as the length and width of the shell compared to those fed on *A. cruetus* and *C. papaya*. The study has demonstrated that vegetable feeds have a significant effect on the growth of *A. achatina* and *A. marginata*. Based on the result of this investigation, *A. achatina* could therefore be recommended to local and small - scale snail farmers in Delta State and Nigeria as a whole for culture since it performed better than *Archachatina marginata*. Similarly, *Talinum triangulare* should be used to feed *Achatina achatina* and *Archachatina marginata*. *Carica papaya* and *Amaranthus cruetus* may also be considered as alternate vegetable feeds for the Africa giant land snails.

Keywords: *Achatina achatina*, *Archachatina marginata*, growth indices, vegetable feeds.

INTRODUCTION

Achatina marginata and *Archachatina achatina* are some of the largest land snails in West Africa. Snails are bilateral invertebrates with soft body and a slippery skin. They belong to the phylum mollusca typified with the possession of segmented exoskeleton in form of calcareous shells (Akinnusi, 1997; Okafor, 2001). *A. marginata* and *A. achatina* dwell mostly in the humid tropical forest where they are picked by snail gatherers for consumption and for sale. Both species are nocturnal in behaviour (Omole *et al.*, 1999; Okafor, 2001). The bulk of snails consumed in Nigeria are picked from the wild and sold in local markets or along roadsides. With the critical economic situation in Nigeria today, there is a radical shift from total dependence on government for job to self-employment. One of such attractive activities for self-employment is snail rearing/snail farming (Elmsile, 1982; Agbogidi and Okonta, 2003; Agbogidi *et al.*, 2005). It is a money spinning business that has a potential of providing a substantial source of protein to complement Nigeria meals (Esak and Takerhash, 1992). Snails come to the Table as a gastronomic delight (Hodasi, 1986; Hodasi, 1989; 2001). Snails are known to be rich in important minerals including - potassium, phosphorus, copper, iron and low in cholesterol and fats (Adiuku, 1993; Ayodele and Asimalowo, 1999). To solve some health and unemployment problem in Nigeria, snail farming becomes very vital (Ademosun and Omidiji, 1999; Abere and Lameed, 2008; Agbogidi *et al.*, 2008). Besides, following the reported decline of wild snails consequent upon increased activities such as deforestation, pesticide application, slash-and-burn agriculture as well as over-exploitation of the species before they reach maturity, it

has become necessary to go into heliciculture as this becomes the only viable conscious effort by man to conserve this multipurpose animal species (Agbogidi, *et al.*, 2005; Agbogidi and Ofuoku, 2006; Ofuoku and Agbogidi, 2006; Agbogidi and Eshegbeyi, 2008). In addition, the richness of snails in terms of nutrients has caused the demand for snails to soar over the years thereby outstripping supply hence the need to encourage its domestication is inevitable (Imevbore and Ademosun, 1988; Ejidike, 2002).

Eruvbentine *et al.*, (1996) reported that snails are predominantly vegetarians and can utilize a number of feeds for growth. Although small-sale snail production is well documented, availability of adequate fresh natural feeding materials for their production seems to hinder large-scale production (Ajayi, 1987; Omole *et al.*, 1999; Wosu, 2003). The objective of this study was to evaluate the growth response of *Achatina achatina* and *Archachatina marginata* as influenced by commonly found vegetables in Nigeria with a view to recommending same to farmers in order to boast small, medium and large-scale snail production in Nigeria.

MATERIAL AND METHODS

The experiment was carried out in 2007 at the Department of Forestry and Wildlife, Delta State University, Asaba Campus (Latitude; $6^{\circ} 14' N$; Longitude $6^{\circ} 4' E$ temperature $28 \pm 6^{\circ}C$; rainfall agro-ecological zone (Asaba Meteorological Station, 2007).

Source of snails

The experiment ran for 12 weeks while parameters were measured on monthly basis. Data



collected were weight of snails, length of shells and width of the shells. The weights of the snails were taken using weight balance; the length of the snails' shells was obtained by measuring the snails from the apex to the base to the nearest centimeters while the width was measured by using a thread to measure the broad circumference of the shell. Data collected were subjected to analysis of variance while significant means were separated with the Duncan's multiple range tests using SAS (2005).

RESULTS AND DISCUSSIONS

Proximate composition and mineral contents of the three vegetables (*Amaranthus cruetus*, *Talinum triangulare* and *Carica papaya*) employed in the study is presented in Table-1.

The results showed an appreciable increase in weight of the snails, the length and width of the shell of the snails with time (Tables 2, 3 and 4, respectively). Significant differences ($P \leq 0.05$) were also observed in the growth characteristics of the snails fed on the three vegetable feeds overtime in all the groups. Snails fed on

Talinum triangulare performed better in terms of weight as well as the length and width of shell and were significantly ($P \leq 0.05$) different from those fed on *Carica papaya* and *A. cruetus* (Tables 2, 3 and 4, respectively). The results also indicated that growth in *A. achatina* is more than that in *A. marginata*. Rate of growth in *A. marginata* was slower when compared with that of *A. achatina*. The rather slow rate of growth may be attributed to the fact that *A. marginata* attains mature live weight between 18 and 24 months (FAO, 1986; Eruvbetine *et al.*, 1986). The difference could also be attributed to the ability of *A. achatina* to convert the feed into flesh and shell more rapidly than *A. marginata*. This could have stemmed from physiological differences in the animal species. This observation is consistent with earlier reports of (Cobbinah, 1990) who noted that *A. achatina* is capable of utilizing a remarkable wide range of food items. Besides, growth rates in organisms are species dependent as influenced mainly by genetic make-up of the organism (Agbogidi and Ofuoku, 2006).

Table-1. Proximate composition and mineral contents of the three vegetable.

Vegetables	H ₂ O	Crude protein	Crude fibre	Ether extract	Ash	Nitrogen free extract	Gross energy	Ca	Mg	K	P	Zn	Ni	Na	Fe	Dry matter (%)	Fat	Total C
			g				Extract MjKG ⁻¹				mg						g	
Amaranthus Cruetus	55.6	23.0	8.8	5.4	19.3	43.5	251.5	2.0	2.5	4.8	0.93	0.9	1.2	7.1	1.1	88.6		
Carica Papaya	77.5	7.0	1.8	-	2.2	-	74.0	34.4	-	65.2	142.0	-	-	16.1	0.8		2.0	11.3
Talinum triangulare	87.8	19.9	11.9	29.2	19.4	19.7	383.2	0.8	0.7	2.7	0.8	0.5	1.3	3.8	0.7	89.6		

Table-2. Weight (g) of *Achatina achatina* and *Archachatina marginata* fed on three vegetables overtime.

Snail species	<i>Amaranthus cruetus</i>				<i>Talinum triangulare</i>				<i>Carica papaya</i>			
	4	8	12	Mean	4	8	12	Mean	4	8	12	mean
<i>Archachatina marginata</i>	98.6c	102.0b	104.7a	101.8	99.61c	105.8b	109.7a	105.0	99.3c	104.6c	106.8a	103.6
<i>Achatina achatina</i>	112.8c	114.7b	115.4a	114.3	114.9c	116.9b	119.8a	117.2	114.2c	115.6b	116.7a	115.6

Means with different letter(s) within the same vegetable across the snail' species are significantly ($P \leq 0.05$) different from each other using the Duncan's multiple range test (DMRT)

Table-3. Length (g) of *Achatina achatina* and *Archachatina marginata* as influenced by three vegetable feeds

Snail Species	<i>Amaranthus cruetus</i>				<i>Talinum triangulare</i>				<i>Carica papaya</i>			
	4	8	12	mean	4	8	12	mean	4	8	12	mean
<i>Archachatina marginata</i>	10.4c	10.8b	11.5a	10.9	10.7c	11.6b	12.3a	11.5	10.6c	11.4b	11.9a	11.3
<i>Achatina achatina</i>	11.7b	11.9b	12.6a	12.0	12.4c	12.8b	13.5a	12.9	12.2b	12.2b	13.1a	12.5

Means with different letter(s) within the same vegetable across the snail species are significantly ($P \leq 0.05$) different from each other using the Duncan's multiple range test (DMRT)

**Table-4.** Width (cm) of *Achatina achatina* and *Archachatina marginata* as affected by three vegetable feeds.

Snail species		<i>Amaranthus cruetus</i>				<i>Talinum triangulare</i>				<i>Carica papaya</i>		
Weeks	4	8	12	mean	4	8	12	mean	4	8	12	mean
<i>A. marginata</i>	13.8b	14.2b	14.8a	14.3	14.9b	14.8b	15.4a	15.0	13.9b	14.4	15.6a	14.6
<i>A. achatina</i>	15.2b	16.0b	16.8a	16.0	15.9c	16.5b	17.7a	16.7	15.4c	16.1b	17.0a	16.2

Means with different letter(s) within the same vegetable across the snail species are significantly ($P \leq 0.05$) different from each other using the Duncan's multiple range test (DMRT)

CONCLUSIONS

This study evaluated the growth response of *Achatina achatina* and *Archachatina marginata* as influenced by three vegetable feeds. (*A. cruetus*, *T. triangulare* and *C. papaya*). It was observed that the snails weight, length and width of the shells fed with the three edible vegetable were significantly ($P \leq 0.05$) higher in *Achatina achatina* than values for the same growth characteristics obtained for *Archachatina marginata*. The study has also demonstrated that snails fed on *T. triangulare* performed better in terms of weight as well as the length and width of the shell and were significantly ($P \leq 0.05$) different from those fed on *A. cruetus* and *C. papaya*.

Based on the results, *Achatina achatina* could therefore be recommended to local and small-sale snail farmers in Delta State and Nigeria as a whole for culture since it performed better than *Archachatina marginata*. Similarly, *Talinum triangulare* should be used to feed *Achatina achatina* and *Archachatina marginata*. *Carica papaya* and *Amaranthus cruetus* may also be considered as alternate vegetable feeds for the Africa giant land snails.

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