

## SHORT COMMUNICATION

### Effect of Soil Moisture Level on the growth of the Giant African Land Snails, *Archachatina marginata* and *Achatina achatina* in different season.

O.G Sodipe<sup>1</sup>, O. A. Osinowo<sup>1</sup>, M.O. Ozoje<sup>2</sup>, A. B. Idowu<sup>3</sup> and S. A. Onadeko<sup>4</sup>  
<sup>1</sup>Department of Animal Physiology, <sup>2</sup>Department of Animal Breeding and Genetics,  
<sup>3</sup>Department of Biological Sciences, <sup>4</sup>Department of Forestry, University of  
 Agriculture, P.M.B. 2240, Abeokuta, Nigeria.



#### Abstract

*This study focused on the evaluation of the effect of soil moisture on the feed intake and weight gain of the Giant African Land snails, Achatina achatina and Archachatina marginata in different seasons using a 2 x 2 x 4 factorial experiment with soil moisture at two levels (low 25ml of water/ week and high 100ml water/week), species at two levels (Achatina achatina and Archachatina marginata) and season at four levels (cold dry, hot dry, hot wet and cold wet) constituting the three factors. Result showed that there was a significant seasonal differences ( $P < 0.001$ ) for weekly feed intake of snails in which values of 3.85, 2.53, 3.88 and 4.44g were recorded in cold dry, hot dry, hot wet and cold wet seasons, respectively. Monthly weight gains of 5.41g recorded for Archachatina marginata was significantly higher ( $P < 0.001$ ) than the value of 1.94g recorded for Achatina achatina. There was significant interaction ( $P < 0.001$ ) between soil moisture level and species on monthly weight gains of the snails. The feed intake and weight gain of snails (4.28 g and 6.43 g) in the high soil moisture treatment was significantly ( $P < 0.01$ ) higher than those in the low soil moisture treatment (3.07 g and 5.30 g). In conclusion, it is evident that species, season and soil moisture level affected the feed intake and weight gain of the Giant African Land Snails.*

**Key words:** Soil moisture, season, species, feed intake, weight gain and Giant African Land snails

#### Introduction

There is a surge of interest in snail farming in Nigeria judging by the number of snail farms being set up particularly in the southern part of Nigeria (Elmslie and Imevbore, 1989). Snail is high in protein, iron and low in fat. It contains almost all the amino acid needed by human beings (Adeyeye, 1996). Due to the nutritive value of snail meat compared to the meat from other animals, there is outstrips demand for snail. It is therefore imperative to encourage mass production of strains that attains

appreciable size in shorter time. Detailed studies of environmental physiology of snails are needed to boost snail growth.

Aestivation is a natural phenomenon known to interrupt the normal physiological process of the snails leading to slow growth rate (Odiette, 1999). Aestivation is affected by the environmental and seasonal changes. Several factors can greatly influence the growth of snails, these include stocking density, stress (light, noise, vibration irregular feeding and unsanitary

conditions), temperature, feed and soil moisture (Akinnusi, 1998).

The objective of this study was to determine the effect of season and soil moisture level on the growth performances indices (feed intake and weight gain) of the Giant African Land Snails, *Archachatina marginata* and *Achatina achatina*.

## **Materials and Methods**

### ***Experimental Animals and Management***

The experiment was conducted at the Snail Research Unit of the College of Animal Science and Livestock Production, University of Agriculture, Abeokuta. A total of ninety - six snails weighing between 100 and 200g were obtained from the existing stock and the local markets (kuto and Sehun market). Forty - eight *Archachatina marginata* and forty - eight *Achatina achatina* snails were exposed to two different soil moisture levels in 4 replications, with 6 snails of each species per replicate, over 4 seasons covering the period of 52 weeks. Forty eight baskets were used with 2 snails per basket. From data obtained from the Ogun Osun River Basin Authority weather station, the seasons were classified into 4 as follows:

Cold dry - 24<sup>th</sup> October 30<sup>th</sup> December

Hot dry - 30<sup>th</sup> December 24<sup>th</sup> March

Cold wet - 24<sup>th</sup> March 21<sup>st</sup> May

Hot wet- 21<sup>st</sup> May 24<sup>th</sup> October

The different soil moisture levels were obtained as thus: Top humus soil obtained from the University Farm was oven dried. Each basket was filled with top humus soil of 1.65 kg and sprinkled with 400 ml of water initially. Baskets on low soil moisture level treatment were sprinkled with 25 ml of water each week while baskets on high soil moisture level treatment were each sprinkled with 100 ml of water each week.

The snails were fed a mixture of layers mash and dried grounded pawpaw leaves (ratio 1:1) daily. The feed and water were provided in plastic troughs. The plastic troughs as well as the baskets were cleaned once a week. The soil was changed every 4 weeks. The baskets were also washed every 4 weeks and the plastic baskets refilled with top humus soil and subjected to the assigned soil moisture treatment.

### ***Data Collection***

To monitor the growth pattern in response to the experimental treatments, the initial body weights were taken at the commencement of the study after which the snails were weighed monthly to determine their weight changes. There was withdrawal of both feed and water from the snails 16 hours before weighing to reduce error due feed and water storage in the shell. Fresh layers mash and dry, grinded pawpaw leaves for each basket were weighed into polythene bags, feed from the polythene bags were offered to the snails in their feed troughs from the first day of each week. The feed residue was recorded every last day of the week to compute the weekly feed intake from which the daily feed intake was computed.

### ***Statistical Analysis***

All data generated were subjected to the least square analysis of variance (ANOVA) procedure using the Systat Analytical Computer Package version 5.0 (Systat Inc.,1995). Significant treatment means were separated using Tukey's high significant differences.

### ***Results***

The effect of season and soil moisture levels on weekly feed intake and monthly weigh gain of the Giant African Land Snails, *A. marginata* and *A. achatina* is shown Table 1. Feed i

**Soil moisture and giant snail**

Table 1: The effect of season and soil moisture levels on weekly feed intake and monthly weigh gain of the Giant African Land Snails, *Archachatina marginata* and *Achatina achatina*

Variable	Sub-class	Feed intake (g)	Weight gain (g)
		LSM	LSM
Species	<i>Achatina achatina</i>	1.94 ± 0.09 <sup>b</sup>	4.132 + 0.520 <sup>b</sup>
	<i>Archachatina marginata</i>	5.41 ± 0.09 <sup>a</sup>	7.598 + 0.52 <sup>a</sup>
Soil moisture level	Low	3.07 ± 0.09 <sup>b</sup>	5.297 + 0.52 <sup>b</sup>
	High	4.28 ± 0.09 <sup>a</sup>	6.433 + 0.52 <sup>a</sup>
Season	Cold dry	3.85 ± 0.07 <sup>b</sup>	6.117 + 0.89 <sup>b</sup>
	Hot dry	2.53 ± 0.11 <sup>c</sup>	4.937 + 0.76 <sup>c</sup>
	Cold wet	3.88 ± 0.14 <sup>b</sup>	7.362 + 0.66 <sup>a</sup>
	Hot wet	4.44 ± 0.14 <sup>a</sup>	5.044 + 0.60 <sup>c</sup>

Means in the same sub class having different superscripts differ significantly (P<0.05)

Table 2 Interactive effect of Soil Moisture Level and Species on Weekly Feed Intake of Giant African Land Snails, *Archachatina marginata* and *Achatina achatina*

Soil moisture level	Species	LS MEANS + SE
Low	<i>Archachatina marginata</i>	1.51 + 0.12 <sup>d</sup>
	<i>Achatina achatina</i>	4.63 + 0.12 <sup>b</sup>
High	<i>Archachatina marginata</i>	2.37 + 0.12 <sup>c</sup>
	<i>Achatina achatina</i>	6.19 + 0.12 <sup>a</sup>

abcd on the same column with different superscripts are significantly (P<0.05) different

intake was higher (P<0.001) during the cold wet and hot wet season than in the cold dry and hot dry season. *Archachatina marginata* had higher weekly intake (P<0.001) than *A. achatina*. The feed intake of snails on high soil moisture level treatment was higher than those on the low soil moisture level treatment.

Table 2 shows the interactive effect of the soil moisture level and species on the weekly feed intake of Giant African Land Snails, *A. marginata* and *A. achatina*. The weekly feed intake of *A. marginata* was significantly higher than (P<0.001) in the two soil moisture level than *A. achatina* hence there was a significant interaction between soil moisture and species.

**Table 3:** Interactive effect of Species and Season on Weekly Feed Intake of Giant African Land Snails, *Archachatina marginata* and *Achatina achatina*

Species	Season	LS MEANS + SE(g)
<i>Archachatina marginata</i>	Cold dry	1.60 ± 0.10 <sup>f</sup>
	Hot dry	1.09 ± 0.16 <sup>g</sup>
	Cold wet	1.93 ± 0.20 <sup>e</sup>
	Hot wet	3.13 ± 0.20 <sup>d</sup>
<i>Achatina achatina</i>	Cold dry	6.093 ± 0.10 <sup>a</sup>
	Hot dry	3.971 ± 0.16 <sup>c</sup>
	Cold wet	5.829 ± 0.20 <sup>b</sup>
	Hot wet	5.751 ± 0.20 <sup>b</sup>

abcdefg values on the same column with different superscripts differ significantly (P< 0.05)

**Table 4:** Interactive effect of Soil moisture level and Season on Monthly Weight Gain of Giant African Land Snails, *Archachatina marginata* and *Achatina achatina*

Soil Moisture Level	Season	LS MEANS + SE(g)
Low	Cold dry	6.10 ± 1.25 <sup>b</sup>
	Hot dry	5.32 ± 1.09 <sup>c</sup>
	Cold wet	4.63 ± 0.93 <sup>f</sup>
	Hot wet	5.14 ± 0.84 <sup>d</sup>
High	Cold dry	6.13 ± 1.25 <sup>b</sup>
	Hot dry	4.56 ± 1.06 <sup>f</sup>
	Cold wet	10.09 ± 0.20 <sup>b</sup>
	Hot wet	4.95 ± 0.95 <sup>b</sup>

abcdef values on the same column with different superscripts differ significantly (P<0.05)

#### *Soil moisture and giant snail*

Table 3 shows the interactive effect of species and season on the weekly feed intake of the two species. *A. marginata* had a higher feed intake across the four seasons than *A. achatina*. Although, *Achatina achatina* had higher feed intake during the wet season (Cold wet and Hot wet) than in the dry season (Cold wet and Hot wet).

Table 4 show the interactive effect of soil moisture level and season on monthly weight gain of giant African land snails, *A. marginata* and *A. achatina*. There was significant

interaction (P<0.05) between the soil moisture level and season. Snails on high soil moisture during the Hot dry season had the lowest weight gain.

#### **Discussion**

The feed intake was higher in the wet season because the snails are highly metabolically active during this season, the soil moisture was higher due to **low atmospheric humidity** which enhances the feed consumption and this confirms the work of Segun (1975). Although, the high feed intake during the cold season disagree with Akinnusi (1998) who

observed that snails consume less in cold dry. The significant interactive effect of species and season in this study confirms the work of Cobbinah (1990) who stated that during the dry season, *A. achatina* becomes inactive and aestivates in order to prevent loss of water from the body thus there is drop in feed intake. The higher feed intake observed in *A. marginata* compared to *A. achatina* might be due to the fact that *A. marginata* is more active than *A. achatina* which complement their energy demand.

Snails on high soil moisture level treatment consumed more feeds because they were more active than those on the low soil moisture level that do aestivate, which is responsible for the higher feed intake noticed in snails on high soil moisture level.

The dry season effect on weight gain in this work confirms the work of Cobbinah (1990), the reduction of weight gain during the dry season, which is a factor of lower feed consumption and the exploitation of the body energy reserve. Higher weight by *A. marginata* in this study confirms the effect of species on the weight gain by snail (Ogunlakin, 1999) which is due to the fact that *A. marginata* consumed more feed than *A. achatina*

because they are good feed converter. However, soil moisture level did not have significant effect on the weight of the snails.

### **Conclusion**

It was evident from this study that species, season and soil moisture level affected the feed intake and weight gain of the Giant African Land Snails. *A. marginata* had higher feed intake and weight gain than *A. achatina*. During the wet season, snails had higher values of the feed intake and weight gain. High soil moisture level lead to higher values of the feed intake and weight gain of the snails examined.

### **References**

**Adeyeye, E. I. 1996.** Waste yield, proximate and mineral composition of land snails found in Nigeria. *International journal of food science and Nutrition* Vol. 47:2, Pp111-116

**Akinnusi, O.1998.** Introduction to snail and snail farming. Omega Science Publishers Lagos. Pp 70

**Cobbinah, J.R.1990.** Snail farming in West Africa. A practical guide. Technical Centre for Agricultural and Rural Cooperation (CTA), Ed-Wageningen. The Netherlands.

**Elmslie, L.J. and Imevbore E. A. 1989.** The concept of snail farming and its future trends in developing countries. Proceedings: Slugs and Snails in world Agric., 64<sup>th</sup> Malacological Society Conference, Edinburgh: Pp 63 67.

**Odiette, W. O. 1999.** Basic Animal Physiology. Diversified Resources Ltd., Lagos. 257pp.

**Ogunlakin, O.D.1999.** Effect of type of feed on reproductive performance of the giant African land snail *Archachatina marginata*. B. Agric. Project. University of Agriculture, Abeokuta. 33Pp.

**Segun, A. O. 1975.** The giant African snails *Archachatina (Calachatina) marginata* Swainson: Dissection guides of common tropical animals. Ethiopia Publishing House, Benin City. 254pp

**Systat, 1995.** Systat Computer Package, version 5.02 Systat, Inc. 1800 Sherman Ave., Evanstor IL USA. 6021, 708, 864, 5670.