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Growth performance of snails (*Achatina fulica*) fed with three different leaf materials

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Abstract

The growth performance of snails (*Achatina fulica*) fed with three different leaf materials was monitored in this study. Forty-five (45) *Achatina fulica* juvenile snails were used for this study and were subjected to three diet treatments (A; *Moringa oleifera* leaf, B; *Carica papaya* leaf, C; *Talinum triangulare* leaf) in three (3) replicates of five (5) snails per replicate, which were housed in Nine (9) rectangular plastic baskets. The Animals were obtained from Afor Agulu market in Aniocha Local Government Area of Anambra State and were transported in a basket covered with dry leaves and acclimatized for one (1) week during which they were fed with chick mash. Data was collected on weekly basis by measuring growth parameters (shell length increase, shell circumference, and weight gain). The result of the data collected showed that snails on diet C (*T. triangulare*) had the best mean shell length increase of (1.11cm) and best mean weight gain of (27.00g) while snails on diet A (*Moringa oleifera*) had the best mean shell circumference increase of (0.35cm). Analysis of variance showed that there was no significant difference in parameters measured. From the result of the study, conclusions were drawn that the leaves used in the study can be incorporated into the diets of snails without any deleterious effect.

Keywords

Moringa oleifera, Carica papaya, Talinum triangulare, Snail Growth

1. Introduction

Snail meat has been consumed by humans worldwide since prehistoric times (Murphy, 2001). Majority of the developing and underdeveloped countries of the world especially Africa is currently in trouble of massive reduction in per capital income and food production, especially within the last few decades (FAO, 1991). The food deficient situation is intensified with protein deficiency when compared to the availability of calories (Cobbinah *et al.,* 2008).

The implication of the alarming increase in population, however, is that many people require snail meat in their diet because of its importance in improving the activities of the hormones and enzymes and its improvement of the defense mechanism of the body (Ademolu *et al.,* 2004). The average citizen cannot afford most of the conventional animal protein sources like: goat, beef, pork and mutton. These major protein sources are currently threatened by high cost of feed, persistent drought, diseases, primitive animal husbandry techniques and low productivity of local animal breeds. (Omole *et al*, 2000).

Omole *et al.,* (2000) reported that different breeds of snails are found in Nigeria and they are characterized by their best efficiency of nutrient transformation into quality protein. *Achatina fulica* is a native of East Africa (Rowson *et al.,* 2010), but it has been widely introduced to other parts of the world through the pet trade, as a food resource, and by accidental introduction. This could explain its existence in Nigeria.

Snail meat is a high quality food that is rich in protein, low in fat and a source of iron calcium, magnesium and zinc (Ademol;u *et al.,* 2004). Snail meat is high in protein (88.37%) and irons (45-50mg/kg), low in fat and contains

almost all the amino acids needed by humans (Cobbinah *et al.,* 2008). A recent study has also shown the glandular substance in edible snail meat cause agglutination of certain bacteria which could be of value in fighting a variety of ailments including whooping cough (Cobbinah *et al.,* 2008).

Edible snails also play an important role in folk medicine. In Ghana, the bluish liquid obtained from the shell when the meat has been removed is believed to be good for infants' development. The high iron content of the meat is considered important in treating anemia. In the past, it was recommended in combating ulcers and asthma (Akinnusi, 2002). At the imperial court in Rome, snail meat was thought to contain aphrodisiac properties and was often served to visiting dignitaries in the late evening.

In West Africa, snail meat has traditionally been a major ingredient in the diet of people living in the high forest belt. In Cote d'ivoire, for instance it is estimated that 7.9 million kg of snails are eaten annually; in Ghana the demand currently outstrips supply.

Growth performance of snails has been reported by many authors to be influenced by a lot of factors; Mogbo *et al.* (2013) reported that growth performance of snail is influenced by different housing types. Growth performance is also influenced by feeding (Siyanbola, 2008; Agbogidi *et al*., 2008) and calcium supplement (Ejidike *et al*., 2004)

This study will help find out source of snail food that won't compete with man for food and also make snails available at all times including dry seasons. The objective of the study is to make available snail feed that will meet the requirement of snails at a cheaper rate. It will help improve the growth performance of growing snails and investigate the effect of some readily available leaf materials on the growth performance of snails. The study also aims to help alleviate poverty but also improve the livelihood of the rural dwellers and finally to provide a cheaper source of animal protein for consumption.

2. Materials and Method

2.1. Study Area

The study was carried out in the Animal house of the Department of Zoology in Nnamdi Azikiwe University, Awka, Anambra State. The study area is located within latitude 06°35' North and 07°2' South and longitude 07° 03' east and 07° 4' West. Average temperature is between 27° C and 30° C with rainy and dry seasons. Awka is a tropical zone of Nigeria; rainy season is between April and October, dry season between November and March.

2.2. Study Animal / Sample Size

Forty-five (45) *Achatina fulica* juvenile snails were used for this study and were subjected to three diet treatments in three (3) replicates of five (5) snails per replicate. The Animals were obtained from Afor Agulu market in Anaocha local government area of Anambra State and were transported in a basket covered with dry leaves. They were left for one (1) week to acclimatize. During the acclimatization period, they were fed with chicken feed.

2.3. Housing

Nine (9) rectangular plastic baskets were used for this study, the baskets were purchased from Eke-Awka together with four yards of net, black cello tape, thread, needle, nine flat plastic saucer for putting drinking water, vernier caliper etc. the nets were cut to the sizes of the perforated baskets and was stacked to the basket with the black cello-tape and sown. The nets prevented insects and parasites from infecting the snails. The baskets prevented the snails from crawling out and also allows for cross ventilation in and out of the house. Each house was filed with loam soil to a depth of 5cm. the soil was prepared by oven drying to a temperature of 60°c for thirty minutes. The soil was oven dried to kill all the micro-organisms in the soil. The soil was mulched with plantain leaves and the leaves were often changed on weekly basis.

Plate 1. *Snail house*

2.4. Feeding

The snails were fed with three (3) different leaf materials;
Diet A - moringa leaf (*Moringa oleifera*)
Diet B - pawpaw leaf (*Carica papaya*)
Diet C - Water leaf (*Talinum triangulare*)

The snails were first left to acclimatize for one week before subjecting them to their various diets and they were fed for four weeks (one month). They were fed every evening because they are nocturnal animals. They were fed with 16g of feed for each replicate and fresh water was also supplied. The drinking plates were shallow to prevent snails from getting drowned, their leftovers were always removed and their feeding plates washed before serving their next feed.

2.5. Proximate Analysis

All experimental diets were subjected to proximate analysis to determine their content using the methods proposed by Association of Analytical Chemists, (AOAC, 1990).

2.6. Data Collection

Shell length, circumference, and weight were taken on a weekly basis. Weight gain was measured on a sensitive balance (Citizens mp-600A) and the average weight of each diet was taken on a weekly basis. The shell increase (shell length) was taken with a meter rule and thread, shell circumference was taken with a venier caliper.

2.7. Statistical Analysis

The data collected was subjected to analysis of variance

3. Results

The proximate composition of the experimental diet is presented in table 1. Table 2 shows the growth parameters of the snails as influenced by the diets and treatment C gave the best yield in all growth parameters.

Table 1. *The percentage proximate composition of Moringa oleifera A, Carica papaya B and T. triangulare leaves C*

Element	Composition %		
	A	B	C
Ash	10.0+0.05	1.92	-
Moisture	10.0+0.03	82.00	-
Protein	1.40+0.1	9.05	3.52±0.32
Fat & Oil	20.0+0.50	3.15	3.52
Carbohydrate	23.6+0.20	73.5	10.87±3.99mg/g
Crude fibre	35.0+0.60	12.38	12
Calcium	1.151*102+0.02mg/l	267.20mg/100g	-
Chlorine	0.319+0.07mg/l	-	-
Phosphorus	3.85+0.04mg/100g	202.72mg/100g	-
Magnesium	-	33.33mg/100g	-
Iron	-	5.90mg/100g	-
Steroids	-	-	106.61±2.53mg/g
Carotene	-	-	114.15±1.49mg/g

Table 2. *Growth parameters of the snails subjected to the diet treatments.*

Growth Parameters	A	B	C
Initial weight (g)	37 ± 3.22	57.57 ± 4.56	52.00 ± 3.61
Final weight (g)	64.33 ± 12.34	82.00 ±5.29	94.47 ± 1.50
Weight gain (g)	27.00 ± 13.00 [a]	24.43 ± 9.64 [a]	42.47 ± 5.08 [a]
Initial shell length (cm)	4.00 ± 0.26	4.51 ±0.16	4.62 ± 0.36
Final shell length (cm)	4.94 ± 0.23	5.30 ± 0.03	5.78 ± 0.58
Shell length increase (cm)	0.94 ± 0.17 [a]	0.79 ± 0.15 [a]	1.11 ± 0.27 [a]
Initial shell circumference (cm)	1.95 ± 0.14	2.16 ± 0.03	2.24 ± 0.11
Final shell circumference (cm)	2.30 ± 1.83	2.34 ± 0.06	2.47 ±0.19
Shell circumference increase (cm)	0.35 ± 0.12 [a]	0.18 ± 0.05 [a]	0.23 ± 0.12 [a]

Rows with the same subscript are not significant

4. Discussion

From the results obtained from this study, it could be deduced that *Carica papaya* had higher moisture (82.00), protein (9.05), carbohydrate (73.5) and crude fibre (35.0) content than the other treatments used in the study; this explains why it gave the best yield in all the growth parameters investigated. The highest ash and fat & oil content were recorded in *Moringa oleifera* while *T. triangulare* is the only treatment which was recorded to be composed of steroids.

Table 2 shows that snails on diet C (*T. triangulare*) had the best mean shell length increase of (1.11cm) while those of diet A (*Moringa oleifera*) recorded (0.94cm), the least shell length increase was recorded for treatment B(*Carica papaya*)(0.79cm). The analysis of variance shows that there was no significant difference (P>0.05) in the length increase of the snails subjected to the different treatments. The increase in shell length of snails fed treatment C could be attributed to the high calcium content of *T. triangulare*. Snails on diet A (*Moringa oleifera*) had the best mean shell circumference increase of (0.35cm) while those of diet C (*T. triangulare*) recorded (0.23cm), the least shell circumference increase was recorded for treatment B(*Carica papaya*) (0.18cm). However, the analysis of variance shows that there was no significant difference (P>0.05) in the shell circumference increase of the snails subjected to the different treatments. Snails on diet C (*T. triangulare*) had the best mean weight gain of (27.00g) while those of diet A(*Moringa oleifera*) recorded (24.43g), the least weight gain was recorded for treatment B(*Carica papaya*) (42.47g). The analysis of variance shows that there was no significant difference (P>0.05) in the weight gain of the snails subjected to the different treatments.

5. Conclusion

Results from the study showed that the various treatments used in the study can be incorporated into the diets of snails without any deleterious effect as there was no mortality recorded for the various treatments used in the study.

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