# ASSESSMENT OF GROWTH PERFORMANCE AND MEAT QUALITY OF AFRICAN GIANT SNAIL (ARCHACHATINA MARGINATA SWAISON ) FED WITH MULLBERRY (MORUS ALBA) AND SIAM-WEED (CHROMOLAENA ODORATA) LEAF MEAL BASED DIET

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## ABSTRACT

*A ten-weeks experiment was carried out to assess the growth performance and meat quality of Archachatina marginata (African Giant Snail) fed with leaf meal of siam-weed (Chromolaena odorata) and mulberry plant (Morus alba) as alternative protein sources.*

*The objectives of the study include determination of the feed efficiency, weight gain, increase in shell length, width and meat quality of snails fed with the two leaf meal-based rations. A total of forty-five matured snails of an average weight 145.7g were used for the studies. The snails were reared inside a six-legged wooden box, allocated in a completely randomized design to three experimental feeding trials of fifteen snails per treatment and three replicates per treatment.*

*Results showed that live weight gain of the snails, protein and fat contents of snails were all significantly influenced ($P<0.05$) by the experimental treatments. Snail meat from the control experiment had the highest protein (23.05%) and fat (1.19%) contents while the least protein content (18.68%) was recorded in carcass from mulberry leaf meal.*

*Results of the study showed that growth performance of African giant snail fed siam-weed and mulberry leaf meals as alternative supplements to soybean meal resulted in favorable performance of the snails. The leaves of the two plant species are therefore recommended as a good substitute for soya bean in snail supplementary ration.*

***Key words:*** Chromolaena odorata, Morus alba, Archachatina marginata, African (34) Giant Snail and growth performance.

## INTRODUCTION

Protein is required by human beings for growth and repairs of body tissues. Protein can be sourced either from plant or animals. Animal protein source is however of higher biological value due to its balanced amino acid and closeness to the protein of human body.

Wide spread level of poverty in developing countries accounted for the emphasis on the consumption of protein from plant source, which is deficient in amino acid like lysine and methionine. Its utilization is also hampered by the presence of anti-nutritional factors. (Omole, 1999). In order to alleviate the deficiency of animal protein being experienced in developing countries, wildlife experts have called for the need to explore cheaper and affordable alternative animal protein sources such as snail.

The African Giant Land Snail *Archachatina marginata* is one of the micro-livestock animals with the potential of meeting the protein needs of both rural and urban dwellers in Nigeria. One of the important ways of harnessing the potentials in snails is through domestication. Homestead and commercial snail domestication if encouraged in Nigeria will not only augment the supply from the wild but it would also ensure all year round availability of the product. (Imran and Alarape, 2012).

High cost of feed ingredients has posed a serious challenge to the poultry and other related industries. Soya bean and fish meal the major supplier of protein in 55the supplementary ration of poultry are increasingly becoming scarce and costly due to their multiple uses Akanji, (2002). These ingredients could be substituted in snail ration with other plant-based materials of similar nutritional qualities. *Morus alba* (Mulberry plant) and *Chromoleana odorata* (Siam weed) are two promising tropical plants with protein content of about 18.6% Shayo, (1997) and 18.7 % Fasuyi, *et. al.*, (2005) respectively.

This study therefore was aimed at evaluating the growth performance and assessment of meat quality of AGLS (*Archarchatina marginata*) fed with siam-weed (*Chromoleana odorata*) and mulberry plant (*Morus alba*) leaf meal based 63supplementary rations

## THE MATERIALS AND METHODS

### Description of the study site

The study was carried out in the snailery unit of the Forestry Research Institute 67of Nigeria, Ibadan (FRIN) which, is situated at Jericho hills within the Jericho Government Reservation Area, Ibadan. It lies between latitude 7° 23'N and longitude 3° 51'S 69respectively. The climate of Ibadan is tropical with mean annual rainfall of about 1,350.00 mm falling approximately in 80 days.

Leaves of mulberry plant were obtained from a ten-year old mulberry plantation of the Forestry Research Institute of Nigeria Ibadan, while siam-weed leaves were also sourced from farmlands within the FRIN premises.

The leaves were subjected to 4 days of sun-drying and then sieved into fine particles. Forty five (45) adult snails were randomly divided into three treatments and each treatment had three replicates of five animals. Treatment 1 was the control with soya bean meal as the main plant protein source. In treatments 2 and 3 soya bean meal was totally replaced with equal amount of siam-weed 80and mulberry leaves in treatments, respectively. The snails were reared inside a six-legged wooden box of 1.2m (L) by 0.2m (W) filled with loamy soils to a depth of about 2 inches. Green pawpaw fruits and supplementary were fed to the snails *ad-libtum* and water provided with concrete watering troughs placed inside each of the wooden compartments. The experiment lasted for ten weeks.

*Experimental design and data analysis*

The experiment was arranged in a completely randomized design (CRD) order 88 and the results obtained were subjected to a one way analysis of variance

(ANOVA). Least Significant Test was also used to determine the level of 90significant among the mean values according to Steel and Torie, (1980)

## RESULTS

The gross composition and calculated nutrient analysis of the experimental diets used for the studies are presented in Table 1. Protein contents in mulberry leaf meal was highest (26.0%), followed by siam-weed leaf meal (23.7%) while the least value (19.8%) was obtained from the control diet.

Table 1 : Gross composition of the experimental diets (%)

| Ingredients | Diet 1 | Diet2 | Diet 3 |
|---|---|---|---|
| Maize | 32.9 | 32.9 | 32.9 |
| Wheat | 14.4 | 14.4 | 14.4 |
| Fish meal | 6.0 | 6.0 | 6.0 |
| Groundnut cake | 9.4 | 9.4 | 9.4 |
| Bone meal | 4.3 | 4.3 | 4.3 |
| Palm kernel | 6.0 | 6.0 | 6.0 |
| Limestone | 6.0 | 6.0 | 6.0 |

Table 1 contd.

| Ingredients | Diet 1 | Diet2 | Diet 3 |
|---|---|---|---|
| Soybean meal | 21.0 | - | - |
| Siam-weed leaf meal | - | 21.0 | - |
| Mulberry leaf meal | - | - | 21.0 |
| TOTAL | 100 | 100 | 100 |
| Calculated nutrient (%) | | | |
| Crude protein | 19.8 | 23.7 | 26.0 |
| Crude fibre | 4.9 | 10.5 | 7.0 |
| Ether extract | 4.2 | 4.2 | 14.7 |
| Ash | 4-4 | 5.7 | 6.0 |

Though the control experiment has the highest average feed intake (2000g) and feed conversion ratio (0.74), mulberry leaf meal (MLM) based ration was best in term of weight gain(58.1g) and shell length increase (1.3cm), while the control ration with soya bean meal as the protein source has the least weight gain (29.8g) and shell length increase (1.1cm) respectively. Live weight gain of snails were significantly influenced($P<0.05$) by the experimental treatments(Table 2).

**Table 2: Overall Performance characteristics of Snails Fed with the Three Experimental Feeds.**



| Parameters Assessed | Diet 1 | Diet2 | Diet 3 |
|---|---|---|---|
| Amount of pawpaw fruit served (g) | 9000 | 9000 | 9000 |
| Dry matter intake of pawpaw fruit (g/snail) | 20.4 | 18.4 | 23.4 |
| Feed Conversion Ratio | 0.03 | 0.03 | 0.04 |
| Amount of supplementary feed served (g) | 2700 | 2700 | 2700 |
| Dry matter intake of supplementary feed (g/snail) | 133.3 | 120.0 | 123.3 |
| Feed Conversion Ratio | 0.74 [a] | 0.67 [a] | 0.68 [a] |
| Initial Body Weight of Snails (g) | 158.5 | 145.3 | 133.2 |
| Final Body weight (g) | 188.3 | 185.0 | 191.3 |
| Body Weight Gain (g) | 29.8 [b] | 39.7 [bc] | 58.1 [c] |
| Initial Length of Shell (cm) | 11.2 | 11.3 | 11.1 |
| Final Length of Shell (cm) | 12.3 | 12.3 | 12.4 |

Table 2 contd.

| Parameters Assessed | Diet 1 | Diet2 | Diet 3 |
|---|---|---|---|
| Shell Length Gain (cm) | 1.1 [d] | 1.0 [d] | 1.3 [d] |
| Initial Circumference of Shell (cm) | 16.8 | 16.9 | 16.2 |
| Final Circumference of Shell (cm) | 18.7 | 18.4 | 18.5 |
| Circumference Increase of Shell (cm) | 2.5 [e] | 1.5[e] | 1.7 [e] |

abcde: Means along the same row with similar superscripts are not significantly different (P<0.05)

The proximate composition of the carcass of snails fed with three experimental feeds are presented in Table 3. The crude protein, crude fibre and fat content were 107significantly influenced (P<0.05) by the experimental treatment. Control experiment 108with soya bean meal as the main protein source has the highest crude protein content 109 (23.05%), followed by the mulberry leaf meal (19.40%) and least for chromoleana 110 leaf meal (18.68%).

**Table 3: Proximate composition (%) of meat of snails fed Chromoleana and Mulberry leaves based diets**

| Parameters | Treatments | | |
|---|---|---|---|
| | DIET I | DIET 2 | DIET 3 |
| Crude Protein | 23.05[a] | 18.68[ab] | 19.40[b] |
| Crude Fibre | 0.10[a] | 0.07[b] | 0.07[b] |
| Fat | 1.19[a] | 1.01[ab] | 0.83[b] |
| Ash | 2.50[a] | 2.25[b] | 2.17[b] |
| Nitrogen Free Extract | 53.16[b] | 57.10[a] | 57.65[a] |
| Dry matter | 20.00[a] | 20.89[a] | 19.88[a] |

ab:.Means along the same column with different superscripts are significantly different (P<0.05).

## DISCUSSION

The protein content of the experimental rations ranged from 19.8 to 26.0%. Mulberry leaf meal has the highest crude protein content probably due to its excellent nutritional value and high in-vitro organic matter digestibility (IVOMD) of above 80% (Omar *et.al.*, 1999). The range of values for crude protein falls in line with the one reported by Fagbuaro, *et. al.* (2006) as the range of crude protein of four species of giant land snails.

The performance of snails on the chromoleana and siam-weed leaf meal diets seemed promising in that weight gain was significantly influenced by the experimental rations. This orroborates the earlier findings of Imran, *et al.*(2009, 2011). The range of fat content in the snail carcass of between 0.83 and 1.19% is closer to the one reported by Kehinde *et al.* (2008). It was observed that protein and fat content of snail carcass in the control diet was higher than values for the two leaf meals. This probably could be attributed to the high percentage of crude protein and fat in the ration.

## CONCLUSION AND RECOMMENDATIONS

The results obtained in this study indicated that chromoleana and mulberry leaf meals are good alternative sources of protein in the formulation of snail supplementary ration, as they have no

negative effect on weight gain, feed intake and other growth parameters. Above all, the use of these leaf meals as alternative sources of protein in the formulation of snail ration could prevent unnecessary competition between man and animal for major feed ingredients.

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