Growth Performance and Carcass Characteristics of African Giant Snails Fed Varying Levels of Mixed *Aspilia africana* and *Moringa oleifera* Leaf Meal

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KEYWORDS

Aspilia africana,
Moringa oleifera,
Growth performance,
African giant snail,
Meat quality.

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ABSTRACT

This study investigated the growth performance and carcass characteristics of the African giant snail (Archachatina marginata) fed varying inclusions levels of Aspilia africana and Moringa oleifera leaf meals. A total of forty-eight snails were used for this experiment which was carried out for eight weeks at the Faculty of Agriculture, Department of Animal Science Teaching and Research Farm, Nnamdi Azikiwe University, Ifite-ogwari. Feeding trial comprises four treatment groups: one control (0% mixed leaf meals) and three experimental groups with 5%, 10%, and 15% inclusions of mixed leaf meal. A completely randomized design (CRD) was used, and each treatment was replicated three times with four snails per replicate. One-way ANOVA was used to analyze the result and significantly different means were separated using Duncan Multiple Range Test. Results indicated that snails on the 10% inclusion diet (T3) demonstrated significantly ($P<0.05$) higher total weight gain and average daily weight gain (18.67 g, 0.33 g/day) respectively compared to other treatments. Other growth parameters measured were not significantly different. Result showed that all parameters measured on carcass characteristics were not significantly different across the treatments. In conclusion, study showed that mixed leaf meal can be incorporated into snail diets without adverse effects. It was therefore recommended that 10% mixed leaf meal (T3) be included in the diets of African giant snails for better total weight gain and average daily weight gain.

INTRODUCTION

Snail farming has gained significant attention as a micro-livestock production and serves as a means of increasing animal protein consumption in Nigeria (Ugwuowo and Ani, 2011; Adeyeye *et al*., 2020). The African giant snail, *Archachatina marginata*, is a highly prized species due to its rapid growth rate, high nutritional value, and adaptability to various environments. Snail meat is high in protein, vitamins and minerals and low in fats and cholesterol (Ghosh *et al*., 2018). Adeyeye *et al*. (2020) reported that snail meat can help to reduce protein malnutrition in Africa. *Archachatina marginata* is increasingly recognized as a nutritious and sustainable source of protein, particularly in regions facing food insecurity and where traditional livestock farming may be limited.

Feed has a lot of effects on the nutritional value of any livestock product, quality of snail meat depends on what they eat. It is therefore important in successful snail production venture to provide the snails with quality feed to enhance performance (Okon *et al*., 2010). Feed is not cheap, so in order to reduce the high cost of

feed, animal nutritionists search for non-conventional feed resources that can serve as alternative to the conventional feed sources.

Moringa oleifera Lamarck which originated from India is widely distributed and has become naturalized in many locations in the tropics (Fahey, 2005). It is a non-leguminous multipurpose tree, one of the fastest growing trees of the world and the leaves are available all year round (FAO, 2014). Moringa is one of the promising plants which could contribute to increased intake of some essential nutrients and health-promoting phytochemicals (Nweze and Nwafor, 2014). It has a high crude protein content ranging from 20- 26% CP in leaves (Asaolu, *et al*., 2011; Okafor *et al*., 2020) with negligible contents of anti-nutrients (Makkar and Becker, 1996; Okafor 2017). Moringa leaf meal has been reported to improve performance in snails (Ani *et al* 2014; Amobi *et al*., 2024).

Aspilia africana, a tropical shrub, is known for its medicinal properties and high protein content (Iwu, 1993). It could be used as growth promoter, immunity booster, lactation stimulant, wound healing agent, and agent in the management of anaemia (Etim *et al*., 2021). Oko *et al*. (2018) reported improvement in performance and egg quality of quails fed 7.5% ethanolic extract of *Aspilia africana* leaf.

The use of locally available and nutrient-rich feedstuffs such as *Aspilia africana* and *Moringa oleifera* has not been thoroughly explored in the context of snail farming. Therefore, the aim of this study was to investigate the growth performance and carcass characteristics of African giant snails (*Archachatina marginata*) fed varying inclusion levels of mixed *Aspilia Africana* and *Moringa oleifera* leaf meal

MATERIALS AND METHODS

This research was conducted at the Faculty of Agriculture, Nnamdi Azikiwe University, Ifite-Ogwari campus, Ayamelum local government area, Anambra state, which is located in the Tropical savanna zone at latitude 6° 36' 28" N and longitude 6° 56' 51" E. The climate at the site is characterized by rainfall (May to November), with the dry season lasting from November to April. Ifite-ogwari has an annual rainfall of 1739.62 mm and an average daily temperature of 25°C. The lowest and highest temperatures are 25.4°C and 30.6°C, respectively (NIMET, 2014).

Feed preparation

Fresh moringa and *Aspilia africana* leaves were harvested within the Nnamdi Azikiwe University, Awka Campus and surrounding. Leaves were allowed to air-dry for three days separately and then removed by carefully beating the branches with sticks. The dried leaves were ground with hammer mill fitted with 2 cm screen for easy mixing with other feed ingredients. The ground ingredients were packed in sacks and stored in a well-ventilated room.

Dietary treatments

Four isonitrogenous diets containing 19.60-20.40 % CP were formulated. *Moringa oleifera* and *Aspilia africana* leaf meals were combined at the ratio of 1:1 respectively and included at 0, 5, 10 and 15%. Each level of inclusion served as a treatment. Other ingredients were maize, wheat offal, soybean, fish meal, common salt, vitamin Premix and bone meal (Table 1).

Experimental animals

Forty- eight (48) *Archachatina marginata* snails with initial average weight of 62.70±0.30g were used for the study. The snails were randomly allotted to four treatments of 12 snails each in a completely randomized design (CRD). Each treatment was replicated three times with 4 snails per replicate. The replicates were housed in 12 units hutch boxes measuring 2 m×2 m each enough to contain 4 snails. Some holes were drilled at the bottom of the box(es) to allow drainage. Then, the boxes were filled with loamy soil to a depth of 20-25 cm. The soil was treated with neem leaf extract to prevent/ kill germs organically. Soil was changed every 2 weeks at the most and snails were washed with a soft scrub (using a soft brush without soap) to remove the dirt on the shell for disease prevention as well as keeping it neat.

Feed and water were provided *ad libitum* throughout the period of the study which lasted for 8 weeks. The feed was moistened before supply to allow for easy ingestion and to prevent respiratory problems. Plastic feeding troughs were used for feeding the snails. Since snails are nocturnal animals and feed mostly at night, they were fed in the evenings, between 16:00 and 18:00 hours. Fresh feed was given to the snails daily. Left

over feed was removed daily from the feeding trough. The quantity of feed that was offered daily was weighed before feeding and the leftover were dried and then weighed to determine daily feed intake. The feeding and watering containers were washed.

Data collection

The initial body weight of the snails was measured on the first day and subsequent weights were taken fortnightly till the end of the experiment using a sensitive digital weigh scale of model SF400 and capacity 10000×1g/353oz×0.foz in g/snail.

The shell length and shell width of the snails were measured with venier calipers on weekly basis. Other parameters measured were feed intake, shell length, shell width, and carcass yield. Feed conversion ratio (FCR) was calculated as feed: gain. Shell thickness was measured in millimeter (mm) using a micrometer screw gauge on weekly basis. Aperture was measured by the use of twine and meter tape in centimeters on weekly basis.

Data analyses

All data collected were analyzed using analysis of variance. Significant differences in means were separated using Duncan Multiple Range Test as described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Table 2 shows the growth performance of African giant snails, *Achachatina marginata* fed varying inclusion levels of mixed moringa and aspilia leaf meal. Weight gain and average daily weight gain followed similar pattern. There were significant ($P<0.05$) differences in total weight gain and average daily weight gain across the treatments. Snails fed 10% mixed moringa and aspilia leaf meal had significantly ($P<0.05$) higher weight gain and average daily weight gain than those on other treatment diets. All other parameters measured showed no significant differences across the treatment. The better growth performance and feed efficiency observed in T3 could be attributed to an optimal balance of nutrients from mixed leaf meal, improving nutrient utilization. Previous findings (Anwar *et al*., 2007; Odo and Orji 2010; Aderinola *et al*., 2013; Okafor *et al*., 2020; Okafor and Nwankwo, 2021) have reported benefits of leaf meals in improving feed utilization, animal growth and feed efficiency due to their rich phytochemical and anti-oxidant properties.

Table 3 showed results on carcass yield of African giant snails (*Achachatina marginata)* fed varying inclusion levels of mixed moringa and aspilia leaf meal. All parameters measured are statistically similar across the treatments. *Aspilia africana* and *Moringa oleifera* are known for its role in improving digestive efficiency and enhancing calcium utilization, which may explain the increased shell weight and thickness observed. The higher foot weight and dressing percentage in T3 suggests that this dietary formulation provided an optimal balance of nutrients for muscle growth, leading to more efficient conversion of feed into edible tissue. This aligns with findings from Odeyinka *et al.* (2008), who demonstrated that snails fed on a balanced plant-based diet showed improved growth rates and better carcass yield.

Table 1: Percentage composition of experimental diets fed to snails (*Achachatina marginata)*

Feed ingredients	Mixed Moringa and Aspilia leaf meal inclusion levels (%)			
	0	5	10	15
Maize	50	50	50	50
Soy bean	26.70	26.70	26.70	26.70
Wheat meal	15	10	5	0
Fish meal	2	2	2	2
Mixed leaf meal	0	5	10	15
Bone meal	6	6	6	6
Vitamin Premix	0.30	0.30	0.30	0.30
Total	100	100	100	100
Calculated composition				
Crude protein	19.60	19.80	20.10	20.40
Energy (Mcal/kg)	2876.60	2733.30	2720.50	2700.40
Crude fibre	4.60	4.83	5.05	5.15

Table 2: Growth Performance of African Giant Snails *Achachatina marginata* fed varying inclusion levels of mixed moringa and Aspilia leaf meal

Parameters	T1	T2	T3	T4	SEM
Initial weight (g)	62.70	63.00	62.70	62.80	2.30
Final weight (g)	76.65	76.42	81.33	77.67	1.50
Weight gain (g)	13.92[b]	13.42[b]	18.67[a]	14.92[b]	1.12
Average daily weight gain (g/day)	0.25[b]	0.24[b]	0.33[a]	0.27[b]	0.02
Average daily feed intake (g/day)	03.50	3.97	4.60	4.47	0.41
Feed conversion ratio	14.50	16.50	14.20	16.90	2.30
Length gain (cm)	0.27	0.20	0.20	0.10	0.053
Width gain (cm)	0.10	0.01	0.10	0.10	0.00
Shell thickness gain	1.06	0.46	0.72	0.74	0.29
Snail aperture gain	1.36	1.46	1.5	0.63	0.24

a,b Means having different superscripts are significantly($P<0.05$), SEM- standard error of means

Table 3: Carcass yield of African Giant snails *Achachatina marginata* fed varying inclusion levels of mixed moringa and Aspilia leaf meal

Parameters	**T1**	**T2**	**T3**	**T4**	**SEM**
Live weight	74.70	86.30	84.0	94.0	3.32
Shell weight	20.00	22.30	20.30	34.70	2.78
Foot weight	31.30	37.70	41.00	32.20	2.40
Visceral/offal weight	16.70	19.00	15.30	18.00	2.44
Dressing percentage	41.90	43.00	49.00	34.70	2.41
%Shell weight/live weight	26.70	25.60	24.00	36.90	2.92
% Visceral/live weight	22.80	21.90	18.30	19.10	2.84

%=percentage, SEM= standard error of means.

CONCLUSION AND RECOMMENDATION

It was concluded that mixed *Moringa oleifera* and *Aspilia Africana* leaf meal can be incorporated in the snail diets without any adverse effects on the growth performance and carcass yield. Mixed *Moringa oleifera* and *Aspilia africana* leaf meal is recommended at 10% inclusion level in the diets of African giant snails (*Achachatina marginata)* for improved total weight gain and average daily weight gain. Further research is recommended on the use of *Aspilia Africana* leaf at different levels in snails and other livestock because of its abundance in nature all year round.

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