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Response of African Giant Land Snail (*Archachatina marginata*) to Graded Levels of *Asplenium barteri* Leaf Meal Supplement

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Abstract: *The effect of feeding graded level (0, 5, 10 and 15%) of Aspelenium barteri Fern leaf meal supplement to growing Archachatina marginata on growth indices, organ weight and carcass characteristics was investigated. One hundred and twenty (120) growing snails (Archachatina marginata) were randomly allocated to four treatments of 30 snails each, replicated three times with 10 snails per replicate in a completely randomized design. The experiment lasted for six (6) weeks. In this study Carcass weight, gut content, feed intake, body weight, shell length/width and FCR differed significantly (P< 0.05) whereas live weight, shell weight, meat content, foot length and foot thickness were not significantly different (P> 0.05) among treatment diets. Diet with 15% inclusion of FLM was considered suitable for best performance.*
Key words: *body weight, carcass, fern leaf, growth, shell weight,*

I. Introduction

African giant snail (*Archachatina marginata*) is one of the most important minor forest products in West Africa and Nigeria in particular. Snail production serves as cheap source of animal protein supply. The meat has a high protein content of about 83 -93% (Imevbore and Ademosum, 1988), making it compare favourably with other conventional protein sources. *Archachatina marginata* eat a wide range of feed but prefer herbs and vegetables; they compete with man for his available vegetable. To prevent unwholesome competition, non-conventional alternate sources of rich feed for snails are and other livestock have become subject of scientific research in recent times (Karsin *et al* 2008; Obun and Ayanwale, 2008; Egena *et al* 2008, Asiegwe *et al* 2008 and Tuleum *et al* 2010). Benefits of using aquatic plants (ferns, duckweed and water hyacinth) as source of protein in animal production with low cost have been demonstrated (Maricel *et al* 1999; Camus *et al* 1991). The present study was undertaken to determine the response of African Giant land snails to graded levels of fern (*Asplenium barteri*) leaf meal supplement

II. Materials And Methods

LOCATION AND DURATION OF STUDY

The experiment was carried out at the Teaching and Research Farm of the Faculty of Agriculture in Niger Delta University, Wilberforce Island, Amassoma, Bayelsa State. The study lasted for six (6) weeks.

EXPERIMENTAL SNAILS AND DESIGN

A total of 135 juvenile snails were randomly assigned to four treatment groups in 3 replicates with 10 snails per replicate in a completely randomized design (CRD).

EXPERIMENTAL DIET

Graded levels of fern leave meal (FLM) was used as a substitute for protein at the rate of 0%, 5%, 10% and 15% in the dietary treatments and designated T1, T2, T3 and T4 respectively. T1 (0% FLM) served as the control diet. The FLM was meticulously mixed with other feed ingredients in a formulated ration as shown in Table 1

Table 1 The formulated diet for snail

Ingredient (0%)	T1	T2	T3	T4
Maize	31.00	29.00	26.	24.00
Wheat offal	16.00	15.00	14.00	13.00
Soya beans meal	23.00	22.00	24.00	25.00
Groundnut cake	10.00	7.00	10.00	7.00
Fish meal	6.25	6.25	3.25	3.25
Palm kernel cake	4.25	4.25	4.25	4.25
Oyster shell	7.75	9.75	6.75	6.75
Bone meal	1.5	1.5	1.5	1.5
Premix/vitamin/mineral	O.25	0.25	0.25	0.25
Fern	0.0	5.00	10.00	15.00
TOTAL (100%)	100.00	100.00	100.00	100.00

MANAGEMENT OF EXPERIMENTAL SNAILS

A cage with rectangular wooden frames and a plywood cover and wire mesh covering the side was used. The bottom was covered with wire mesh and perforated polythene to allow free drainage of water. The snails were fed *ad-libitum* for 6 weeks. Measurement of the shell length increment and width was done using vernier caliper (to the nearest millimeter). The weight of snails was taken on a weekly basis by means of electric weighing balance measured in grams. At the end of the experiment ,two of the snails were eviscerated from the shell. The eviscerated snail parts were weighed individually and recorded. Shell, carcass, meat content, and the gut content weighed separately. 30cm ruler was used to measure the foot length and foot thickness while vernier caliper was used to measure the shell length and width of the snails.

CHEMICAL ANALYSIS

The proximate analysis. Showing nutrient profile of the FLM supplement and constituted diet profile of the fern (Asplenium barteri) and the experimental feeds (Table 2 and 3) were carried out according to the procedures described by A.O.A C (1995)

Table 2 Chemical composition of (*Asplenium barteri*)Fern Leaf Meal supplement (FLM)

Constituent's	**%**
Moisture	11.80
Crude Protein	9.63
Crude fibre	14.84
Ether extract	3.00
Ash	7.20
NFE	53.54
Total	100.00

Table 3 Chemical composition of the experimental diets

Constituents	**T1 (%)**	**T2 (%)**	**T3(%)**	**T4(%)**
Moisture	14.00	14.00	16.20	19.00
Crude Protein	17.06	13.17	15.63	18.16
Ether Extract	11.00	7.00	4.00	4.00
Crude fibre	9.47	8.99	9.85	11.83
Ash	6.44	8.00	9.00	10.00
NFE	42.13	48.84	45.32	37.01
Total	100.00	100.00	100.00	100.00

STATISTICAL ANALYSIS

The data obtained from all the parameters were subjected to statistical analysis. The analysis of variance was used according to the method of Steel and Torrie (1981), means that were significant were separated using Duncan's multiple Range Test (Duncan, 1995)

III. Results And Discussion

Proximate composition of the FLM and the proximate composition of the compounded experimental diet are shown in Table 2 and 3. A crude protein of 9.63% is relatively high and contrast well with crude protein reported in literature for feed stuffs (Sese *et al* 2013), Effect of the experimental diet on growth performance of African Giant Land snail is shown in Table 4 and 5. The values for each parameter for average feed intake, mean body weight, mean shell length and mean shell width were not very wide but differ significantly ($P<0.05$) with the control diet. Feed intake values were significant ($p<0.05$) implying that the experimented feeds was accepted by the snails. Feed intake is subject to palatability and animals are known to eat more when feed is palatable and tasty. African Giant Land snails have been reported to be picky in their feed choices, preferring succulent leafy plants (Okpeku and Omueti, 2003). The significance in body weight is an indication that what was consumed was well utilized by the snails; this also was evident in significant values recorded for shell length and width. This supports the theory that African giant Land snails eat to increase the shell length and width to make room for growth of the internal mass (Hodasi, Awesu and Imevbore).Apart from gut weight, other parameters in Table 5 were not significant ($P>0.05$) indicating that the experimental snails responded equally to both the experimental and control diets. .Low percent mortality recoded only for snails in Diet T4 is an indicator that FLM supplemented feed for snails pose no threat to the well being of the snails. .

Table 4 Impact of FLM on Average feed intake, body weight, shell length shell width and feed conversion ratio.

Parameters	T1 Mean	T2 Mean	T3 Mean	T4 Mean	SEM	Sig
Average feed intake (g/snail)	7.06^{a}	6.60^{a}	5.27^{b}	5.04^{b}	0.19	<0.05
Mean body weight(g/snail)	66.44^{a}	65.56^{a}	63.67^{b}	61.62^{c}	0.66	<0.05
Mean shell length (mm/snail)	78.79^{a}	79.74^{a}	76.52^{b}	76.51^{b}	0.43	<0.05
Mean shell width (mm/snail)	45.09^{a}	44.69^{a}	42.43^{b}	43.29^{b}	0.36	<0.05
Feed conversion ratio	0.11^{a}	0.10^{a}	0.08^{b}	0.09^{b}	0.00	<0.05

Mortality (%)	0	0	0	0.03	0.00	0.07

Means with different superscripts in each row are significantly different ($p<0.05$).

Table 5 Effect of FLM Supplement on live weight, shell weight and carcass

Weight (g)	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	Sig
Final Live weight (g)	147.00	148.66	155.33	158.66	10.79	0.08
Carcass						
Shell weight (g)	43.00	80.33^{a}	83.33^{a}	88.00^{a}	5.10	<0.05
Visceral weight (g)	62.33^{b}	80.33^{a}	83.33^{a}	88.00^{a}	5.10	<0.05
Meat content (g)	46.33	45.33	55.33	56.33	4.71	0.08
Gut content (g)	15.33^{b}	17.67^{ab}	23.67^{a}	23.67^{a}	2.22	<0.05
Foot-length (cm)	6.67	7.50	7.50	7.70	0.34	0.07
Foot thickness (cm)	1.60	1.73	1.80	1.80	0.16	0.08

Means with different superscripts in each row are significantly different ($p<0.05$).

IV. Conclusion

The present study showed that it is safe to supplement African giant land snail diet with FLM up to 15%. Low percentage mortality recorded in the study also confirms that MFL FLM is not toxic and can be tolerated by snails. FLM is a water weed growing wild and cost very little to add to snail feed. This could help also in cost saving of feed without compromising feed quality.

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