

Research Paper

UTILIZATION OF EXCLUSIVE CASSAVA BY-PRODUCT BY AFRICAN LAND SNAIL (*Archachatina marginata swainson*)

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Abstract

Performance response of snails fed exclusive cassava by-products (leaf, sieviate, chaff and peel) was evaluated with three hundred and seventy five growing snails, allotted to 5 treatments, and each treatment was replicated 5 times in a completely randomized design. Each diet served as a treatment, with pawpaw leaf diet as control. The diets were pawpaw leaf (T₁), cassava leaf (T₂), cassava peel (T₃) cassava seriate (T₄) and cassava chaff (T₅). Parameters evaluated were feed intake, weight gain, shell morphological changes, apparent digestibility of nutrients and costs per gram weight gain. All data were subjected to the Analysis of variance and treatment means were separated using Duncan's Multiple Range Test. Results showed that snails fed cassava leaf and pawpaw leaf were both superior in performance characteristics than those on cassava peel. Snails fed cassava sieviate and cassava chaff had the least feed intake ($30.7 \times 10^{-1} \pm 0.01$ and $30.8 \times 10^{-1} \pm 0.02$ g/day) and weight gain ($27.1 \times 10^{-2} \pm 0.001$ and $27.3 \times 10^{-2} \pm 0.001$ g/day) respectively. Least cost of feed per weight gain was obtained in snails fed cassava leaf. Therefore, it was concluded that snails successfully utilized the cassava by-products. They however perform better when fed cassava leaf and pawpaw leaf.

Key words: African land snail, utilization, exclusive cassava by-products, performance, digestibility.

INTRODUCTION

The importance of protein in the diet of man cannot be over-emphasized. Protein is required for growth, repair of body tissues and is the principal component of body organs and tissues. The problem of protein consumption in Nigeria is characterized by inadequate supply and high cost [1]. [2] opined that conventional protein sources like beef, chicken, mutton and goat meat were grossly inadequate to meet the protein needs of Nigerians, due to the vagaries of factors militating against the development of livestock sector, such as high cost of establishment and feeding, pest and diseases, inadequate land and pollution. There is therefore, the need to diversify animal production, by shifting from conventional animal protein production to other sources. This pursuit has led man to domesticate wildlife, like African giant rat, grass cutter and African land snail [3]. The meat of snail is cherished and regarded as a delicacy, due to its high quality protein, low fat, and its richness in mineral salts like iron, calcium and magnesium [4]. The popularity of African land snail is increasingly reduced by indiscriminate hunting and deforestation, which destroys snail's habitats. The

domestication of snail would therefore help to satisfy the demand for its meat and conservation of the species. The use of cassava by-products in the feeding of snail will, fit into the farming system of the farmers. The choice of this crop is due to its availability and the vantage position of Nigeria in the world cassava production [5]. The present study was therefore designed with the main objective to determine the effect of feeding exclusive cassava by-products (leaf, sieviate, chaff and peel) on growth performance and nutrient digestibility of African land snail.

MATERIALS AND METHODS

Experimental site: The experiment was conducted at the Wildlife Section of the Forestry Research Institute of Nigeria, Ibadan.

Experimental Animals and their Management: Three hundred and seventy five growing snails of an average weight of $88.95 \pm 8.1\text{g}$ were used for the trial. They were randomly allotted to five treatments (T_1 , T_2 , T_3 , T_4 and T_5) with each replicated five times at fifteen snails per replicate in a Completely Randomized Design. The snails were fed exclusively on cassava by-products (cassava leaf, peel, sieviate and chaff). In the control, the snails were fed pawpaw leaves (T_1), cassava leaf (T_2), cassava peel (T_3), cassava sieviate (T_4), and cassava chaff (T_5). Feed and water were served in concrete containers in the evenings (17.00-18.00 hours). Pawpaw leaf and cassava by-products fed to the snails were chopped and served at 3% of their body weight.

Evaluation of Performance Indices: Feed intake and weight gain were measured on daily and weekly basis, respectively, using electric weighing balance. The shell length and width were measured with Vernier caliper, while the Micrometer screw gauge was used to measure the shell thickness.

Digestibility Trial: Five snails per replicate were used for this trial. They were accommodated singly in the cells of metabolic cages; each cell has a dimension of $0.01 \times 0.015\text{m}^2$. The base of the cage was padded with thin foam for easy collection of excreta. The snails were fed with the same diet used during the feeding trial. Record of feed intake and excreta voided were taken. The daily excreta from each treatment were dried to constant weight in a hot air oven at a temperature of 105°C . The dried samples were stored inside refrigerator for proximate constituent determination [6]. The values obtained were used to evaluate the apparent digestibility of nutrients. The digestibility trial lasted seven days, three days for acclimatization and four days of sample collection.

Data Analysis: All data were subjected to the analysis of variance and treatment means were separated using Duncan's Multiple Range Test [7].

RESULTS AND DISCUSSION

The results of the proximate composition of the feedstuffs used for this feeding trial are shown in Table 1, which include cassava by-products and pawpaw leaf. The basis for choosing them is their all year round availability, acceptability by snails and ease of collection for utilization by farmers for snail production at little or no cost. It is pertinent to note that in most locations, they constitute environmental population menace, due to their poor handling; their utilization in snail nutrition may reduce the cost of production. The result revealed cassava and pawpaw leaves as protein concentrate, with 19.42% and 31.35% crude protein respectively. The low crude protein contents of cassava sieviate, chaff and peel, with values ranging from 2.34% to 3.94% confirms the findings of [5], that cassava by-product are low in protein. Their diets need fortification with other protein sources, such as fish meal, groundnut cake and soybean, which is expensive, due to their utilization in human nutrition, thus

reducing the net economic returns accruable to former adopting cassava by-products based diets [8]. The proximate determination also revealed that cassava and pawpaw leaves are highly mineralized as shown by their levels of ash.

Table 2 shows significantly ($p < 0.05$) better feed intake, weight gain and shell growth parameters of snails fed pawpaw (T_1) and cassava leaves (T_2), which could be attributed to their higher crude protein contents and also with improved palatability and feed intake [2]. Average weekly feed intake in T_1 (7.32g) and T_2 (7.43g) compared, and were significantly higher than values for snails fed cassava peel (T_3), Cassava sieviate (T_4) and cassava chaff (T_5). The crude protein content of the feedstuffs is an important factor that affect voluntary feed intake, which consequently has effect on weight gain and feed conversion ratio. Better feed conversion ratio values were obtained for snails in T_1 (7.32) and T_2 (7.43), attributed to their higher protein contents and balanced amino acid profile [9]. The shell morphological parameters, such as shell length, thickness and width, were significantly affected by the treatments. The reports of [10] revealed that calcium and phosphorus were the major mineral salts in the shell of snails and their bio-availability is greatly linked to feed intake and crude protein content of the feed. The feeding trial revealed that shell length increment in T_1 (0.54mm), T_2 (0.53mm) and T_3 (0.53mm) compared favorably, snails in T_3 fed cassava peel had the best shell width increment, this could be due to the high level hemicelluloses in the peel, which enhanced peel utilization in monogastric animals [11]. The digestibility of crude protein and crude fiber compared in snails fed T_1 , T_2 and T_3 and were better than those on T_4 and T_5 , due to the higher crude protein contents of cassava and pawpaw leaves. This also corroborated with the findings of [2] that high level of dietary crude protein improved feed palatability and digestibility in poultry. Snails being a monogastric animal could also be similarly affected.

CONCLUSION

Therefore, this study has shown that snail utilized the cassava by-products without any deleterious effect on growth, shell morphology and nutrient digestibility. However the performance indices evaluated were most outstanding in snails fed cassava and pawpaw leaves respectively. Therefore, the adoption of the cassava by-products in snail nutrition is advocated.

ACKNOWLEDGMENT

The authors are grateful to the Executive Director and Management of Forestry Research Institute of Nigeria (FRIN) for the permission and assistance to successfully conduct this research in the Institute.

Table 1: Proximate Composition of Cassava by-products and Pawpaw leaf

Parameters (%)	Test ingredients				
	T ₁ (PL)	T ₂ (CL)	T ₃ (CL)	T ₄ (CS)	T ₅ (C)
Crude Protein	31.35	19.45	3.94	2.34	3.62
Crude fiber	11.42	12.12	16.21	7.35	3.98
Ether Extract	0.76	2.10	1.03	0.25	0.46
Ash	10.86	8.94	4.67	5.12	4.25
Nitrogen Free Extract	45.61	57.39	78.09	87.41	81.66

CL = Cassava leaf,
CS = Cassava sieviate,
PL = Pawpaw leaf
CPL = Cassava peel
CC = Cassava chaff

Table 2: Growth Performance and Nutrient Digestibility of Snails fed Cassava by-products and Pawpaw Leaf.

Parameters	T ₁ (PL)	T ₂ (CL)	T ₃ (CPL)	T ₄ (CS)	T ₅ (CC)	SEM
Average Initial body weight (g/snail)	88.75 ^a	89.71 ^a	88.68 ^a	89.01 ^a	89.56 ^a	0.97
Average Final body weight (g/snail)	143.05 ^a	142.96 ^a	120.12 ^b	111.84 ^c	112.45 ^c	4.68
Average weekly weight gain (g/snail).	4.53 ^a	4.44 ^a	2.62 ^b	1.90 ^c	1.94 ^c	1.15
Average weekly feed intake (g/snail)	33.22 ^a	32.47 ^a	25.36 ^b	21.48 ^c	21.58 ^c	1.89
Feed conversion ratio	7.32 ^c	7.43 ^c	9.68 ^b	11.29 ^a	11.31 ^a	0.25
Average weekly shell length increment (mm/snail)	0.95 ^a	0.72 ^b	0.61 ^c	0.56 ^d	0.57 ^d	0.01
Average weekly shell thickness increment (mm/snail)	0.03 ^b	0.03 ^b	0.07 ^c	0.02 ^b	0.02 ^b	0.01
Average weekly shell width increment (mm/snail)	0.54 ^a	0.53 ^a	0.52 ^a	0.46 ^b	0.46 ^b	0.04
Crude protein digestibility %	76.25 ^a	75.25 ^a	74.28 ^b	72.15 ^b	72.12 ^b	2.98
Crude fiber digestibility %	60.86 ^a	60.05 ^a	59.86 ^a	57.75 ^b	57.26 ^b	1.14
Ether extract digestibility %	80.05 ^a	81.09 ^a	79.09 ^b	75.00 ^c	75.04 ^c	0.20
Cost feed/ kg (₦)	5.00	5.00	5.00	5.00	5.00	-
Feed cost/ kg weight gain (₦)	35.00	35.00	50.00	50.00	60.00	2.45

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

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