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Growth, Cost and Carcass Evaluation of Snail (*Archachatina marginata)* Fed Diet Containing Yam Peel-Soy-Bean Residue Mixture Meal

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ABSRACT

The study was conducted to determine effect of inclusion of dry Yam peel-soybean residues meal (YPSM) as substitute to Maize in the diet of snail (*Archachatina marginata*). A total of 120 growing snails (average weight of 76.5 ± 2.4g, 4 months old) were used for the study. Four dietary treatments comprising Yam peel-soybean residue meal (YPSM) replaced maize at 0% ($YPSM_1$), 50% ($YPSM_2$), 75% ($YPSM_3$) and 100% ($YPSM_4$) were compounded and allotted to snails in a completely randomized design. Data were collected on growth performance, reproductive indices, cost implications and carcass yield were statistically analyzed using analysis of variance. There was no significant difference in the mean total feed intake in $YPSM_1$, $YPSM_2$ and $YPSM_3$ ($P>0.05$). The mean total weight gain was significantly different across the treatments ($P<0.05$) although no significant difference in the mean total weight gain in $YPSM_1$, $YPSM_2$ and $YPSM_3$. The mean shell length was not significantly influenced by dietary treatments and the values ranged between 12.68 in $YPSM_1$ and 12.48 in $YPSM_4$. Shell width and thickness were not significantly different from one another as the level of YPSM in the diet increased ($P>0.05$). The lowest cost/weight gain was recorded in the diet containing 75% YPSM as replacement for maize while the highest cost/weight gain was recorded in the diet containing 100%YPSM. Based on the results obtained from this study, it could be recommended that Yam peel-soybean residues meal

(YPSM) could be included up to 75% as replacement for maize fraction of the diet of snail (*Archachatina maginata*) without adverse effect but at reduced cost.

Keywords: Feed efficiency, Dressing percentage, Snails, Soybean residue, Soybean meal, performance.

INTRODUCTION

The importance of snail farming cannot be over-emphasized as a source of snail meat which is rich in protein and calcium. The protein content of the meat compared favourably with other conventional meat like mutton, pork, chicken meat among others. The low cholesterol and fat contents of snail meat makes it a choice or delicacy meat. The meat commands higher price than other conventional meat. Snail can be reared in both urban and rural areas because it does not constitute any nuisance to the environment and could be reared at small, medium and large scale depending on the capital and interest of the investors. Major factor that affects livestock production in Nigeria is feed. The shortage of feed in livestock production has led to increase in cost of production. Many farms that could not cope has to be shut down because of high cost of production hence, there is need for alternative feedstuffs such as agricultural by-products (Omole *et al.,* 2014; Omole *et al.,* 2016). Soybean is a grain that could be processed into milk or toasted for different uses. The by-product of soymilk processing often referred to as soybean milk residue (SBR) can be used as feed for livestock. Soybean milk residue is rich in protein and fibre. According to Popoola *et al.,* (2020) and fayenuwo *et al*., (2017), the residue contains 25-30% crude protein. The crude fibre of the residue is composed of cellulose, hemicellulose and lignin. It also contains about 10-15% oil. The high quality protein fraction has good water holding and emulsifying qualities Omole *et al.,* (2018). Yam peel is very common in South-Western Nigeria and Nigeria in general, Yam peel is gotten after peeling whole yam tuber and very rich in Fibre, carbohydrates but low in Protein while soybean residue is rich in protein. There is paucity of information on the use of SBR in the diet of snail. Hence, the study was conducted to determine the effects of Yam peel-soybean residue meal as replacement for Maize on growth performance (feed intake, weight gain, feed efficiency, shell length, width and thickness increment).

METHODOLOGY

Experimental Site

The experiment was out at the Snailery Unit of the Institute of Agricultural Research and Tra8ining (I.A.R. & T.), Moor Plantation which is located on Longitude 03°51E, Latitude 07°23N and Altitude 650'. The area is in the humid zone of Southwestern Nigeria with a mean annual rainfall of 1220 mm and mean temperature of 26°C.

Experimental Design

A total of 120 snail (*Archachatina marginata*) of relative the same weight and the same breed was used for the experiment. The low fenced pen used for the experiment was demarcated into 12 compartments. Each compartment has a dimension of 0.4 x 0.4 x 0.5m^3. The cover of the cage was of mosquito nets reinforced with wire mesh. Sandy loam soil was used as bedding for the snails. The ratio of yam peel to Soybean residue is 3:1. A total of 120 growing snails (*Archachatina margi*nata) with a mean weight of 76.5 ± 2.4gapproximately 3 months old were used for the feeding trial. Four dietary treatments were formulated to contain Yam

peel-soybean residue meal at 0% (YPSM $_1$), 50% (YPSM $_2$), 75% (YPSM $_3$) and 100% (YPSM $_4$) as a replacement for maize. Completely randomized design was the experimental design with 10 snails per replicate for each of the treatment. The diets were formulated to contain about 24% crude protein and energy of 2400 kcal/kg ME (Table 1). Management practices during the feeding trial was as described by Omole *et al. (*2016).

Data Collection

Feed intake and weight gain of snails were measured daily and weekly, respectively using a sensitive weighing scale. Feed intake was calculated by removal of left-over feed from feed offered while the weight gain was by deducting the initial weight from the final weight. Shell length and width were measured on weekly basis using a vernier caliper.

Micrometer screw gauge was also used to measure the shell thickness on weekly basis. Feed conversion ratio was calculated as the ratio of feed intake to weight gain. Feed cost and cost per weight gain were also calculated. The feeding trial lasted for 12 weeks. Carcass analysis was carried out at the end of the feeding trial by randomly selecting 4 snails from each replicate and weighed separately. Each snail was killed by striking the shell with a club. The shell, foot and viscerals were separated and weighed separately. The chemical composition of the experimental diets and the foot were determined as described by the method of AOAC (1990). All the data were subjected to analysis of variance and the means were separated using Duncan Multiple Range Test (SAS, 2000).

Table 1: Gross composition of experimental diets used for the experiment

Percentage inclusion of soybean residue					
Ingredient (%)	Cost (₦/kg)	$YPSM_1$ (0%)	$YPSM_2$ (50%)	$YPSM_3$ (75%)	$YPSM_4$ (100%)
Maize		44.0	22.0	11.0	0.0
YPSM		0.0	22.0	33.0	44.0
GNC		26	26	26	26
Fish meal		2.5	2.5	2.5	2.5
*Other fixed ingredients		27.5	27.5	27.5	27.5
Total		100.0	100.0	100.0	100.0
Cost/kg (N)		151.34	149.34	137.2	134.32
Calculated Composition					
Crude protein (%)		24.22	24.21	24.13	24.08
ME (kcal/Kg)		2605.2	2599.3	2589.45	2572.12

ME= Metabolisable energy *Others fixed ingredients: Brewer dry grain= 15.05, Bone meal= 2.3; Oyster shell= 9.70; Methionine= 0.1; Lysine= 0.1; Premix= 0.25; Salt= 0.1.

RESULTS AND DISCUSSION

The gross composition of the experimental diet is as show in table 1, YPSM fraction in diets was replace maize at 0, 50, 75, and 100%. There was significant differences in the mean total feed intake as observed in Table 2. The highest feed intake was recorded in diet fed diet containing 75% YPSM while the lowest feed intake was recorded in diet containing 100%YPSM. There was no significant difference in the mean total feed intake in $YPSM_1$, $YPSM_2$ and $YPSM_3$ ($P>0.05$). The increased feed intake from YPSM1 to YPSM3 could be due to increased protein levels. It has been reported that snails tend to eat more when the feed is low in fibre and high in protein levels (Odeyinka, 2014; Popoola *et al*.,2016: Omole, *et.al.,*2012).

The mean total weight gain was significantly different across the treatments (P<0.05) (Table3) although no significant difference in the mean total weight gain in $YPSM_1$, $YPSM_2$ and $YPSM_3$. The mean shell length was not significantly influenced by dietary treatments and the values ranged between 12.68 in $YPSM_1$ and 12.48 in $YPSM_4$. Shell width and thickness were not significantly different from one another as the level of YPSM in the diet increased (P>0.05). The feed conversion ratio was significantly different from one another (P<0.05) across the treatments. The best feed: Weight gain ratio was recorded in diet containing 50% YPSM which was relatively the same with $YPSM_1$ and $YPSM_3$. The least FCR was recorded in $YPSM_4$ which is as a result of low feed consumption and lowest weight gain as observed in Table 2. The results of carcass composition (Table 3) revealed that the dressing percentage across the treatments were significantly influenced by different inclusion levels of YPSM in the diets (P>0.05) The lowest dressing percentage was recorded in the diet containing 100% YPSM. No significant differences were observed in snails fed diet containing 50 and 75% YPSM. The results of the dressing percentage compared favourably with the reports of Odeyinka, (2014) and Owosibo *et al.,* (2021). The results of cost analysis showed that cost /kg feed reduced as the levels of YPSM in the diets increased from diet containing from) to100% as shown in Table2. The total feed cost also follow the same trends with cost/kg feed. The total feed cost at 0% inclusion of YPSM was N106.40 while it reduced to N82.60 in diet containing 100% YPSM. The lowest cost/weight gain was recorded in the diet containing 75% YPSM as replacement for maize while the highest cost/weight gain was recorded in the diet containing 100%YPSM. The reduction in feed cost was due to low cost of YPSM compared to maize. It could be concluded that Yam peel- soybean residue meal could be as alternative feed ingredients and could replace maize fraction of the diet of snails up to 75% There were significant difference in the feed intake, weight gain and feed conversion ratio. and at reduce Based on the results obtained from this study, it can be recommended that Yam peel-soybean residues meal (YPSM) could be include up to 75% in the diet of snail (*Archachatina maginata*) without adverse effect cost.

Table 2: Summary of Performance of Snail fed containing Yam peel- Soymilk residue Meal mixtures

Parameters	$YPSRM_1$ (0%)	$YPSRM_2$ (50%)	$YPSRM_3$ (75%)	$YPSRM_4$ (100%)	± SEM
Final weight (g)	347.06^{a}	348.94^{a}	345.05^{ab}	283.66^{b}	13.90
Total weight gain (g)	264.72^{a}	266.65^{a}	262.27^{a}	200.99^{b}	17.12
Total feed intake (g)	884.18^{a}	887.95^{a}	889.1^{a}	848.18^{b}	12.88
Feed conversion ratio (g)	3.34^{b}	3.33^{b}	3.39^{b}	4.22^{a}	0.24
Shell length increment (g)	12.68	12.67	12.65	12.48	0.32
Shell width increment	11.54	11.55	11.52	11.52	0.24
Shell thickness increment	0.16	0.16	0.15	0.15	0.03
Dressing percent (%)	44.45^{a}	44.44^{a}	44.43^{a}	42.13^{b}	2.97
Cost/kg feed (g)	119.55^{a}	110.05^{b}	104.92^{c}	98.34^{d}	2.89
Cost/weight gain (₦ /kg)	394.07^{b}	362.78^{c}	345.85^{d}	413.00^{a}	7.88

Means along rows with different superscript are significantly different from each other (P<0.05)

Table 3: Summary of carcass composition of Snail fed containing Yam peel- Soymilk residue Meal mixtures

Parameters	$YPSRM_1$ (0%)	$YPSRM_2$ (50%)	$YPSRM_3$ (75%)	$YPSRM_4$ (100%)	± SEM
Live weight (g)	347.78	346.59	345.65	283.66	23.45
Shell weight (g)	76.99	76.70	80.17	80.85	2.78
Offal weight (g)	74.91^a	75.93^a	77.59^a	65.18^b	3.12
Foot weight (g)	154.57	154.02	153.57	119.50	4.99
Dressing percent (%)	44.45^a	44.44^a	44.43^a	42.13^b	2.97
Offal/live weight (%)	22.12	22.13	22.45	22.98	2.31
Shell/live weight (%)	23.4	23.39	23.25	23.23	2.41

Means along rows with different superscript are significantly different from each other (P<0.05)

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