# Assessment of Nutritional Potentials and Economic Significance of Sesame Seed Meal (*Sesamum indicum*) in the Diet of Growing Snails (*Archachatina marginata*)


## ABSTRACT

The purpose of this study was to assess the economic effects of replacing the groundnut cake meal portion of the diet with sesame seed meal (SSM) on the performance traits, carcass analysis, and cost benefits of the feeding strategy. One hundred and twenty snails, weighing an average of 175±2.7g, were divided into four dietary regimens at random and reproduced three times. Each replication had ten snails in it, following a completely randomized design. Four diets were formulated to contain SSM at 0% ($SSM_1$) Control, 50% ($SSM_2$), 75% ($SSM_3$), 100% ($SSM_4$) as replacement for soybean meal fraction in the diet of growing snails. The diets were formulated to contain about 24% crude protein and energy of 2400 kcal/kgME. Data were collected on Feed intake, weight gain, shell length, thickness and width, Feed conversion ratio and cost per weight gain. The findings indicate that the different inclusion levels of SSM in the diet had a significant impact on the mean total feed intake ($P<0.05$). The feed intake and mean total weight gain showed similar trends. ($P<0.05$) was the greatest mean weight gain. The ratio of feed intake to weight gain, or feed conversion ratio (FCR), was essentially constant across all treatments. The diet with the highest level of SSM4 (100%) inclusion had the lowest cost per weight (CPW) gain (N170.61), while the control diet with 0% SSM1 inclusion had the highest CPW gain (N221.88). It is however interesting also to note that as feed intake (kg) increases, CPW (N) gain reduces. The dressing percent (DP) of the snail was significantly influenced by the dietary treatments.



*Keywords: Sesame; dressing percentage; snails; feed conversion; feed intake; soybean meal; dietary treatments.*


## 1. INTRODUCTION

"One of the major limitations to the efficient snail rearing is the availability of quality feed at affordable price" [1]. "In the era of globalization, which tend to lose traditional foods with the result of nutrient deficiencies and negative health consequences. Most often the interruption of a regular supply plays a critical role in the declination of traditional foods such as sesame" [2]. "Sesame is an important cash crop that can be grown with limited resources. In recent decades it has drawn interests of many researchers and developers. This study analyzed the economics of Sesame (*Sesamum indicum* L.) as alternative feed resource in the diets of snails. The protein feed stuff mainly used in livestock production in Nigeria are groundnut cake, soybean meal and fish meal etc" [1,3]. "The high cost of groundnut cake meal as a source of animal protein necessitates looking for alternative source of animal protein which is affordable and available. Sesame seed meal is nutritious and contain high protein level of about 55% crude protein. The moisture content, crude fiber, ash content, fat, crude proteins and carbohydrate of sesame samples ranged between 3.15% and 5.52%, 4.21–4.40%, 3.10–4.75%, 55.75–56.9%, 22.65–23.39% and 8.34–8.80%, respectively", Beshaw et al., [4]. "These results suggest that sesame seeds are important plant sources of protein composed of approximately 77% essential amino acids (lysine, isoleucine, methionine, cystine, tryptophan and phenylalanine etc.)" [5]. "They could therefore be used to solve protein-energy malnutrition. Sesame seed meal has been used in the diet of broilers and layers with impressive results on

growth performance and carcass yield" [6]. Groundnut cake meal is expensive than SSM, the prevailing cost of GNC/kg during the course of this experiment groundnut cake was N385 while the cost of SSM/kg is N235. There is paucity of information in the use of SSM in the diet of snails hence this study was conducted to determine the economic implication and effect of feeding snail with sesame seed meal as replacement for groundnut cake meal fraction of the diet on performance characteristics and carcass analysis.

## 2. MATERIALS AND METHODS

A total of one hundred and twenty snails of mean weight 175±2.7g were randomly allotted into four dietary treatments replicated three times and each replicate contained ten snails per replicate in a completely randomized design. The snails were acclimatized for one week before the commencement of the feeding trial. Four diets were formulated to contain SSM at 0% ($SSM_1$) Control, 50% ($SSM_2$), 75% ($SSM_3$), 100% ($SSM_4$) as replacement for soybean meal fraction in the diet of growing snails. The diets were formulated to contain about 24% crude protein and energy of 2400 kcal/kgME (Table 1). "Feed intake and weight gain were measured on daily and weekly basis with the use of sensitive weighing balance respectively. Feed intake was calculated by subtracting the left-over feed from the feed given while the weight gain was calculated by deducting the initial weight from the final weight. Shell length and width were measured on weekly basis with vernier caliper. Micrometer screw gauge was used to measure the shell thickness on weekly basis. Feed conversion ratio were calculated as the ratio of feed intake to weight gain. Feed cost and cost per weight gain were also calculated. Carcass analysis was carried out at the end of the feeding trial by randomly selecting eight snails from each treatment and weighed separately. Each snail was killed by striking the shell with a club. The shell, foot and visceral were separated and weighed separately. The chemical composition of the feed and the meat were determined according to the method of A.O.A.C. [7]. All data were subjected to statistical analysis using analysis of variance and the means were separated if they are significantly different using Duncan Multiple Range Test" [8].

**Table 1. Gross composition of experimental Diet**

| Ingredient (%) | $SSM_1$ (0% SSM) | $SSM_2$ (50% SMM) | $SSM_3$ (75% SSM) | $SSM_4$ (100% SSM) |
|---|---|---|---|---|
| Maize | 22.00 | 22.00 | 22.00 | 22.00 |
| Groundnut cake meal | 24.00 | 12.00 | 6.00 | 0.00 |
| Sesame seed meal | 0.00 | 12.00 | 16.50 | 22.00 |
| *Others | 54.0 | 54.0 | 54.0 | 54.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Cost/kg feed (N/kg)** | 104.67 | 100.89 | 96.67 | 83.25 |
| **Calculated analysis** | | | | |
| Crude protein (%) | 23.63 | 24.02 | 24.32 | 24.47 |
| Metabolizable energy (kcal/KgME) | 2438.1 | 2411.6 | 2401.3 | 2383.3 |

**Other fixed ingredients: B.D.G- 12.8, Rice bran- 15, Fish meal-4, Soy bean meal-10, Bone meal-2.15, Oyster shell-9.8, Premix-0.25*
*SSM- Sesame seed meal*

## 3. RESULTS AND DISCUSSION

The chemical composition of the sesame seed meal and groundnut cake meal showed that the crude protein and crude fibre were relatively the same (Fig 1), chemical composition calculated was similar to the result of Sene et al. [9]. The results of growth performance of the snails fed varying levels of SSM in the diet is shown in Table 2. The mean total feed intake was significantly influenced by the varying inclusion of SSM in the diet ($P<0.05$). The increased feed intake from SSM1 to SSM4 could be due to differences in protein level in the diet. Snails tend to eat more when the protein level of the diet increases [1,10,3,11]. "The mean total weight gain followed the same pattern with the feed intake. The highest mean weight gain was ($P<0.05$) was recorded in the diet containing 100% SSM as replacement for groundnut cake meal (GNC). The feed conversion ratio (FCR) which is the ratio of feed intake to weight gain was relatively the same in all the treatments. The relatively the same FCR reported in the study is an indication that SSM could be used to replace GNC in the diet of growing snails. The FCR reported in this study was in agreement with observation of several authors who reported FCR ranging between 3.78 and 4.21" (Omole *et. al.,* 2007) [10]. "There was no significant difference in the mean shell length and values ranged between 9.78 and 9.79mm as shown in Table 2. Also the mean shell width thickness also were not significantly influenced by the dietary

treatments (P>0.05). This observation also buttressed the fact that SSM could be used as replacement for GNC. Also there was no case of shell deformity in all the treatments. The zero mortality recorded could be due to proper management practice such as cleaning of the environment, regular washing of feeding and water troughs, proper shading and others as recommended by different authors" (Omole et al., 2007) [10]. "The zero mortality reported could also be due to fact that the test ingredient used in this study was well processed and preserved and did not have any deleterious effect on the snails" [12,13,6]. The report of zero mortality was an indication that sesame seed meal could be used as feed resource for snail. The result of cost analysis is as shown on Fig 2, the cost/kg feed reduced from N54.67 in SSM1, to N43.25 in SSM4, also the total feed cost reduced as the level of SSM in the diet increased from 0% in SSM1 to 100% in SSM4. The lowest cost per weight gain (CPW) was recorded in the diet containing high level of SSM in the diet (control diet) while the highest CPW was recorded in the control diet containing 0% SSM. The lowest cost/kg feed, total feed cost and cost per weight gain reported in this study could due to high price of GNC compared to SSM. The prevailing market price of GNC during course of the feeding trials was N385 while the cost of SSM was N235. The reduced cost reported in this study was in agreement with several authors that replaced conventional feed stuffs, such as maize, soya bean meal, groundnut cake meal with unconventional ones such as noodle waste meal, chicken offal meal, kenaf grain meal, kola testa meal e.t.c [1,10,3]. The lowest cost/ weight gain reported is an indication that sesame seed

**Table 2. Summary of Growth performance of growing snails fed varying levels of SSM in the diet**

| Parameters (Means) | $SSM_1$ (0% SSM) | $SSM_2$ (50% SMM) | $SSM_3$ (75% SSM) | $SSM_4$ (100% SSM) | ±SEM |
|---|---|---|---|---|---|
| Initial weight (g) | 154.15 | 154.69 | 152.92 | 138.08 | 5.89 |
| Final weight (g) | 342.67$^{b}$ | 344.69$^{b}$ | 346.33$^{ab}$ | 350.5$^{a}$ | 6.45 |
| Total weight gain (g) | 188.52$^{b}$ | 190.00$^{ab}$ | 193.41$^{ab}$ | 212.42$^{a}$ | 5.39 |
| Total feed intake (g) | 780.41$^{c}$ | 779.77$^{b}$ | 789.56$^{a}$ | 810.49$^{a}$ | 8.72 |
| Feed conversion ratio | 4.13 | 4.10 | 4.08 | 3.81 | 0.14 |
| Shell length increment (mm) | 9.78 | 9.78 | 9.79 | 9.81 | 1.02 |
| Shell width increment (mm) | 8.34 | 8.35 | 8.35 | 8.38 | 0.49 |
| Shell thickness increment (mm) | 0.11 | 0.11 | 0.13 | 0.13 | 0.01 |
| Mortality (Number) | 0.00 | 4 | 2 | 0 | |

*Means along rows with different superscript are significantly different from each other (P<0.05)*
*SSM- Sesame seed meal*

**Table 3. Cost analysis of growing snails fed varying levels of SSM in the diet**

| Parameters (Means) | $SSM_1$ (0% SSM) | $SSM_2$ (50% SMM) | $SSM_3$ (75% SSM) | $SSM_4$ (100% SSM) | ±SEM |
|---|---|---|---|---|---|
| Total weight gain (kg) | 0.19 | 0.19 | 0.19 | 0.21 | - |
| Total feed intake (kg) | 0.78 | 0.78 | 0.79 | 0.81 | - |
| Cost/kg feed (N) | 104.67$^{a}$ | 100.89$^{b}$ | 96.67$^{c}$ | 83.25$^{d}$ | 2.12 |
| Total feed cost (N/kg) | 81.64$^{a}$ | 78.69$^{ab}$ | 76.36$^{ab}$ | 67.43$^{b}$ | 2.22 |
| Cost/weight gain (N/kg) | 429.68$^{a}$ | 414.15$^{b}$ | 401.89$^{c}$ | 321.09$^{d}$ | 4.78 |

*SSM- Sesame seed meal*

**Table 4. Carcass analysis of growing snails fed varying levels of SSM in the diet**

| Parameters (Means) | $SSM_1$ (0% SSM) | $SSM_2$ (50% SMM) | $SSM_3$ (75% SSM) | $SSM_4$ (100% SSM) | ±SEM |
|---|---|---|---|---|---|
| Live weight (g) | 343.10$^{b}$ | 344.71$^{ab}$ | 347.73$^{a}$ | 350.23$^{a}$ | 4.12 |
| Shell weight (g) | 79.32 | 79.79 | 80.66 | 81.39 | 4.13 |
| Offal weight (g) | 69.61$^{b}$ | 71.15$^{b}$ | 73.34$^{a}$ | 73.97$^{a}$ | 1.35 |
| Foot weight (g) | 150.75$^{b}$ | 151.66$^{b}$ | 154.97$^{ab}$ | 159.95$^{a}$ | 5.86 |
| Dressing percent (%) | 43.81$^{b}$ | 43.87$^{b}$ | 44.44$^{ab}$ | 45.67$^{a}$ | 2.01 |
| Offal/live weight (%) | 20.23 | 20.58 | 21.03 | 21.12 | 2.18 |
| Shell/live weight (%) | 23.05 | 23.08 | 23.13 | 23.24 | 2.27 |

*Means along rows with different superscript are significantly different from each other (P<0.05)*
**SSM- Sesame seed meal*

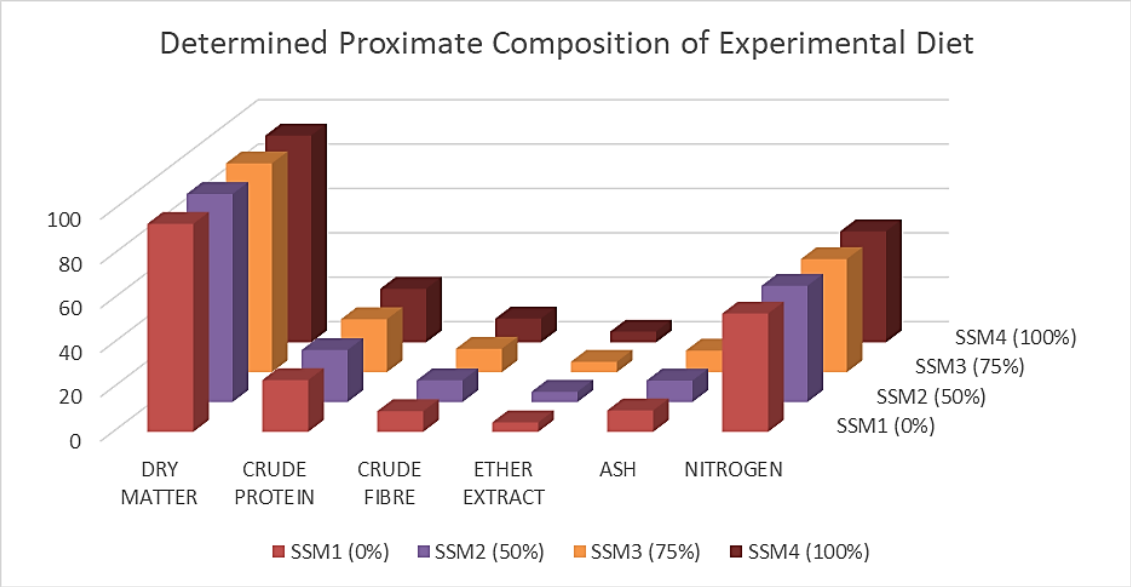


**Fig. 1. Determined proximate composition of experimental diet**

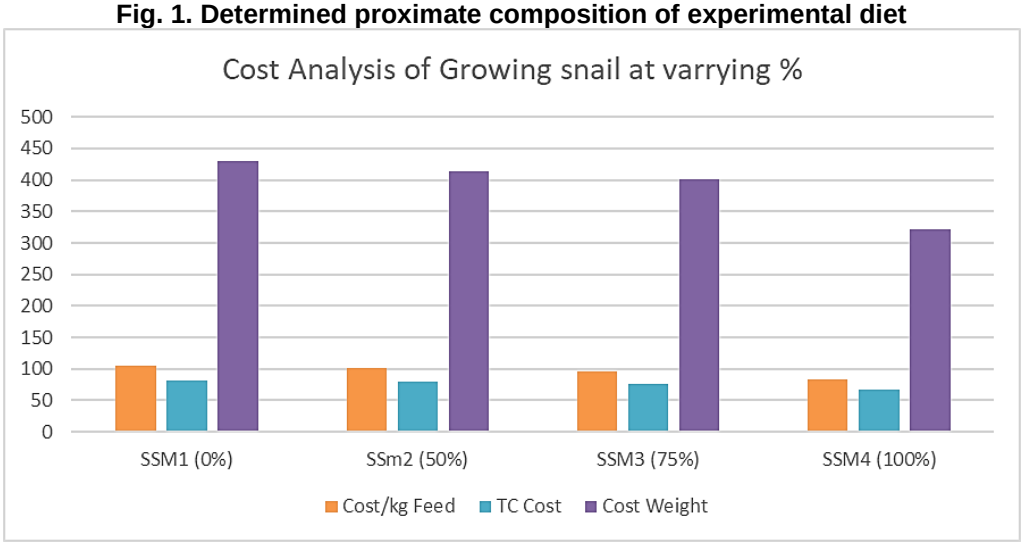


**Fig. 2. Cost analysis of growing snails fed at varying levels of SSM in the diet**

meal could be used to replace groundnut cake at reduced cost. The dressing percent (DP) of the snail was significantly influenced by the dietary treatments as shown in Table 4. The DP was relatively the same in SSM1, SSM2 and SSM3 ($P>0.05$) while the highest DP was recorded in SSM4. The offal/ live weight and shell/live weight percent were not significantly influenced by the varying inclusion of sesame seed meal as in the diet. The highest dressing percent recorded in SSM4 could be due to increased crude protein level of the sesame seed meal as early discussed. The dressing percent recorded in all the treatments fell within the range recorded by several authors [1,10].

## 4. CONCLUSION AND RECOMMENDATION

The study concluded that groundnut cake meal could be substituted partially or wholly at varying percentage with sesame seed meal without any adverse effect on feed intake, weight gain and dressing percentage. Also, the cost per weight gain was noticed to reduce at high inclusion of sesame seed meal in the diet of snail. The study however recommends that Sesame seed is a better alternative feed resource in the diet of snails which also helps to enhance the growth performance at a reduced depending on inclusion level in their feed.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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