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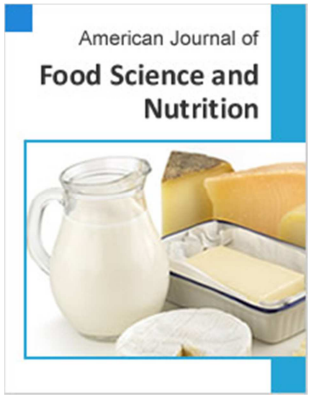

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Performance of Juvenile Snail Fed Enzyme Supplemented *Gmelina arborea* Leaf Meal as Replacement for Groundnut Cake

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Abstract

Nigeria continues to experience animal protein shortages for human consumption due to many challenges facing the livestock industry. Snails as a member of the livestock group constitute an important source of animal protein which can take care of this shortfall if feeding and other management practices are properly addressed. It contains about 18-20% protein in wet weight basis, high iron content of (45-59mg/kg), low in fat (0.05-0.08%) and contains almost all the amino acids needed for human nutrition. The effect of different level of *Gmelina arborea* leaf meal (GALM) and enzymes supplementation on the growth characteristics of Juvenile land snail (*Archachatina marginata*) was investigated in a Completely Randomized Design (CRD) which lasted for ten weeks. Three levels of GALM (0, 25 and 50%) and two supplementation levels (no enzyme, enzymes supplementation) were studied. A total of two hundred and seventy (270) juvenile snails were used for the experiment with six diets, three replicates and fifteen animals per replicate. Final body weight (g) recorded were 101.64g, 96.90g, 89.18g, 95.32g and 96.50g for 0, 25, and 50% GALM inclusions, no supplement and enzymes supplement respectively. The result indicated that rate of gain (g/day) and daily fed intake (g) decreased consistently with increase in level of GALM, while supplementation with enzymes increased the rate of gain and daily feed intake. It was observed that up to 25% level of GALM level inclusion pose no harm to the growth and development of juvenile snail. Therefore, up to 25% GALM inclusion level in snails diet is recommended and in the same vein enzyme supplementation in the diets of snails should be encouraged since it improves growth characteristics.

1. Introduction

The rapid growth in the population of the developing countries like Nigeria has resulted to a higher demand of protein of animal origin. Mean while, increasing the production of animal protein at a reasonable cost to enhance the diet quality of the populace has been part of the national agricultural policy and the use of micro livestock and short circle animals have been suggested to overcome the animal protein insufficiency, hence, the need to improve on the feeding management and productive performance of livestock in Nigeria has become very important.

One of the ways of meeting animal protein requirement is the introduction of non-traditional meat source such as snail. Snail has been recognized to have a very important

role to play in the supply of animal protein to Nigerian populace especially in the rural and peri-urban areas [1]. Snails have been well known and highly appreciated by Africa and Nigeria consumers in particular for the tasty and delicious nature of the meat [2]; [3]. The meat contains 18-20% crude protein and calcium content is high [1]; [4]. The low Cholesterol level and high iron content of the meat is a good antidote for fat related diseases [1]. Snails are delicate animal with high reproductive rate, genetic potential and a rapid rate of maturity. They are efficient in feed utilization with less competition with man for food, they are unconventional animals of economic importance.

In addition to the nutritional value of snail meat, recent studies in field of medicine shows how snail play a vital role in preventing vascular diseases due to cholesterol [5]. It is also recommended for patient with coronary heart problem because of its good protein source and low sodium level; the glandular substance from edible snails causes agglutination of certain bacteria which could be of values against a variety of ailment including whooping cough while the high iron content of snail meat is considered as a means of combating ulcer and asthma [6].

Enzymes are feed additives use in animal feeds which lead to a better utilization of the feeds as well as other trace elements and nutrients. Enzyme according to [7] are naturally occurring proteins that act as biological catalyst, aid chemical reactions by accelerating reactions that will otherwise proceed very slowly. Animal feed is composed of plant materials, cereals and vegetable proteins, cereals and vegetable proteins, which cannot be fully digested and utilized by animals. However, feed utilization and digestion can often be increased by the addition of external enzymes to feed. Many cereals have a proportion of their energy in the form of non starch polysaccharides (NSPs), more commonly known as fibre. Enzymes are to break down this fibre, which leads to increase in metabolisable energy and protein utilization.

The incorporation of feedstuffs containing incriminating factors may adversely affect the performance of monogastric. The nutritional strategy involving the use of feed enzymes offer immense potential to overcome the problems. The interest in the feed enzymes is a reflection in changing the attitude of the society and the economic climate of the feed industry. It has been seen that approximately two billion tons of cereals grains and 140 million tons of legumes and oil seeds are produced throughout the world each year [8] which yield an estimated 230 million tons of Non starch polysaccharides (NSP) as a part of variety of products. The digestibility of NSPs is very low in monogastric and large amounts are voided through the feaces. NSPs are able to bind large amount of water and as a result the viscosity may cause problems in the small animal's digestion of fat, protein and carbohydrate. These problems can be overcome by addition of enzymes to feed.

The unconventional feedstuffs or non conventional feeding materials has gain acceptance as feed stuff in livestock diets, since they are locally available and considered to be non – conventional feeding materials. The nutrient profile of these leaf meals compare favourably well with some conventional feeding materials. Protein from plant leave source is perhaps the most naturally abundant and cheapest sources of protein [9] such that there has been growing realization in the use of plant leaf meals in livestock diets.

Developing countries of the world including Nigeria continue to experience decrease in food supply even in the face of population increase. Most staple foods are carbohydrates especially among the poor who constitute the majority, thereby widening the worsening situation of protein consumption, especially animal protein which contain more essential nutrients that the plant protein. Leaf, Euphorbia heterophylla has been utilized successfully as sole feed for growing Archachatina marginata snails with egg shell added to the soil for optimal performance [10].

According to [11], eggshell is the best source of calcium for growing snails fed a basal diet of milk leaf, however, based on the overall performance, in the absence of eggshell, oystershell can be utilized.

Gmelina arborea has been found to be useful in monogastric feed and nutrients. A research conducted by [12] showed that the leaves and fruits of *Gmelina arborea* could be use as an alternative feedstuff or supplements for sheep and virtually most monogastric animals. While a study conducted by [13] using *Gmelina arborea* leaf meal (GALM) in diets of rabbits showed that GALM can be utilized in the diet of monogastric animals which will also reduce competition from conventional feedstuff between man and his animals.

2. Materials and Methods

A total of six pots (6) locally constructed with aluminum was used. The posts were constructed at 1m depth, with holes perforated at the side of the pot to avoid water logging. Dried soil was collected and subjected to heating for about five (5) hours with constant stirring to sterilize and destroy pathogenic microorganisms. The pots were filled with the sterilized soil in equal proportion to a maximum of 30cm of the depth coupled with sterilized soil in each pot. The pot was placed in a well-ventilated area under shade, and the top was built of mosquito netting reinforced with wire mesh to avoid escape and enhance maximum ventilation for the snails.

Animal Diet and Experimental Design

A total of two hundred and seventy (270) juvenile snails were used for the experiment that lasted for ten (10) weeks. The snails were randomly allocated to six (6) dietary treatments. Each treatment had three (3) replicates and each replicate will have fifteen (15) snails. Two (2) levels of supplementation; no enzyme added and enzyme supplementation with three levels (3) *of Gmelina arborea* inclusion of 0, 25, and 50% were used. The pots were supplied with adequate moisture while feed and water was given *ad-libitum*. Records of initial weight, weekly live

weight, shell length, feed intake per snail and the feed to gain ratio (FGR) was calculated. The experimental design was a 3x2 factorial experiment in Completely Randomized Design (CRD).

3. Results and Discussion

The growth performance characteristics of juvenile snails fed varying levels of GALM with or without enzyme supplementation in replacing groundnut cake are presented in table 1. The initial weights of the juvenile snails were not significantly different (P>0.05) from one another across all experiment diet. All values were 60.0g. There was significant effect (P<0.05) of the treatments on the rate of weight gain per day. The highest value of 0.60g was obtained on snails fed 0% GALM inclusion (control diet) which was slightly higher (P<0.05) than that obtained at 25% GALM inclusion (0.53g) but significantly higher (P<0.05) than 0.42g recorded on juvenile snails fed 50% GALM inclusion level. There was significant effect (P<0.05) of enzyme supplementation on the rate of weight gain per day. There was increase in the rate of weight gain per day with enzyme supplementation, all values were significantly different (P<0.05). There was significant effect on interaction of the levels of GALM and supplement fed on the rate of weight gain per day.

There was a significant effect (P<0.05) of the treatments on the obtained daily feed intake by the juvenile snails. The feed intake values ranged between 1.84 and 2.17g per snail per day. There was a significant effect (P<0.05) of enzyme supplementation on the obtained feed intake values. The highest (P<0.05) feed intake value of 2.00g was recorded in the enzyme (Maxigrain) fed snails while the least feed intake (1.95g) was recorded in snails fed no supplement. An interaction between levels of GALM and supplements at all possible combination had an effect (P<0.05) on the daily feed intake obtained on the juvenile snails.

Table 1. *Growth performance Characteristics of Juvenile Snails fed GALM with or without Enzyme Supplementation in replacing Groundnut cake.*

Level of GALM (%)	Initial weight (g)	final weight (g)	rate of gain (g/day)	daily feed intake (g)	feed to gain ratio
0	60.00	101.64^{a}	0.60^{a}	2.17^{a}	3.64^{c}
25	60.00	96.90^{b}	0.53^{b}	1.93^{b}	3.66^{b}
50	60.00	89.18^{c}	0.42^{c}	1.84^{c}	4.42^{a}
SEM	0.002	1.832	0.027	0.049	0.134
SIGNIFICANCE NS	*	*	*	*	
SUPPLEMENTS					
No supplements 60.00	95.32^{a}	0.50^{b}	1.95^{b}	3.90^{b}	
Added					
Enzyme (Maxigrain)	60.00	96.50^{a}	0.52^{a}	2.00^{a}	3.96^{a}
SEM	0.0017	0.3079	0.0043	0.0114	0.0212
SIGNIFICANCE	NS	*	*	*	*
GALM* Supplement NS (Interaction)	*	*	*	NS	

Treatment means with different superscripts along the same column are significantly different (P<0.05).
NS- Not significantly different (P>0.05).
SEM- Standard Error of mean

The varying levels of GALM had significant effect (P<0.05) on the efficiency of feed utilization. Values recorded were 3.64, 3.66 and 4.42 respectively at 0, 25 and 50% inclusion level of GALM respectively. This indicate that feed to gain ratio increased (P<0.05) as the level of GALM increased from 0 to 50%. Hence, there was a significant increase (P<0.05) in feed utilization as the GALM level increased. The dietary supplements had a significant influence (P<0.05) on the feed to gain ratio of the juvenile snails, values recorded were 3.96 and 3.90 on snails fed enzyme supplement and snails fed no enzyme supplement respectively. The efficiency of feed utilization had no significant effect (P<0.05) on the interaction between levels of GALM and supplements.

4. Conclusions and Recommendations

Gmelina arborea is a woody plant with deciduous broad leaves. *Gmelina arborea* meal has a nutritional value similar to that of other conventional feed stuff, and as such, can be used as an alternative ingredient for formulating feeds especially for monogastric. It is a promising feedstuff which is available at much lesser price, has less competition in term of alternative uses, and in this study, it is found to pose no harm to snails. Based on the result from this experiment, growth performance of juvenile snails fed GALM such as final weight and feed to gain ratio increases with increasing level of GALM inclusion while rate of gain (g/day) and daily feed intake decreases with increasing level of GALM inclusion in the diets of juvenile snails. Enzyme supplementation gave better performance on the juvenile snails in term of efficiency of feed utilization, rate of weight gain, feed intake, feed to gain ratio, rate of gain of shell length and rate of gain of shell thickness, overall cost of production and cost per weight gain when compared to snail fed no enzyme supplementation.

Based on the result of this study, feed millers and livestock farmers should explore the Potentials of *Gmelina arborea* leaf in the formulation of feed for snails and other monogastric. This has the promise of cutting down cost since leaves are mostly available with little or nocompetition for alternative uses. Up to 25% inclusion has been found in this study to be none toxic to snails as minimal mortality was equally recorded the cause of the study. Enzyme supplementation in the diets of snails improves growth

characteristics and should been couraged.

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