Effect of Different Levels of Plantain Peel Meal as Diet on the Productive Potentials of *Archachatina Marginata* (Swaison)

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Abstract

This study determines the productive potentials of Archachatina marginata (Swaison) fed with different levels of plantain peels meal (PPM) as diets. Twenty seven juveniles of giant African snails were used for the experiments that lasted for eight weeks. The snails were allotted into three treatment groups with three replicates each. Three snails constituted a replicate laid in completely randomized design (CRD) format. The treatment groups were; feeds with concentrate only (T_1), concentrate and 50g of plantain peel meal (T_2), and concentrate with100g of plantain peel meal (T_3). The data generated were analyzed using SPSS software. Parameters measured including body weight gain, feed efficiency, shell length, shell circumference, groove diameters and the sensory attribute. Results obtained in the stuffy snail fed with concentrate with100g of plantain peel meal performed best in all parameters assessed with values of average weight gain of (177.00g), average shell length (12.60g), groove diameter (8.10) and shell circumference (18.50g) respectively. Snails fed with concentrate and 50g of PPM had 38.72% in terms of dressing percentage followed those fed with concentrate only (36.22%) while those fed with concentrate and 100mg of PPM had the least value (34.42%) respectively. From the results, it was concluded that concentrate and 100g PPM was suitable for snail diets as it gave the best performance. The palatability test revealed that meat sample of treatment 3 had the most satisfactory rating in terms of flavour and overall acceptability, indicating that PPM positively influenced the meat qualities.

Keywords: Plantain Peels, Productive Potentials, *Archachatina marginata*, Diet

INTRODUCTION

Snails are versatile invertebrates which belong to the kingdom: Animalia, phylum: Mollusca and Class: Gastropoda. They are second largest animals with shell. There are three genera of snails which are *Archachatina marinate, Achatina achatina,* and Limicoloria. Gastropoda is divided into two sub-classes i.e. Prosobranchia (non-edible) and pulmonata (edible). In West African there are many edible snails; only that emphasis is usually laid on two species; *Achatina achatina* and *Archachatina marginata,* which dwell preferably in humid forest area. Snails have a remarkable ability for converting dead and decaying plants into highly nutritious flesh. They feed mainly on green leaf, fruits, tubers, flower and also supplementary feeds (Oketola, 2008).

Feeding accounts for a reasonable percentage of the cost of livestock production and a major factor determining the viability and profitability of livestock farming ventures. In view of this, many studies are shifting interest to the use of feedstuffs such as roots, leaves, tubers and their by-products which can probably reduce feed cost and ultimately the production cost of livestock farming (Agbabiaka *et al.,* 2013). Snails have many nutrition and medicinal value. It is rich in

protein, iron and low cholesterol (Adeyeye, 1996) in summary; it contains most amino acids needed by man. Animal protein is of high biological value and possessed all the essentials amino acids in desirable quantities. Source of animal protein are the products (meat, milk and eggs) of macro and micro livestock. Macro livestock in which proteins are found are large farm animal such as sheep, goat and cattle. The cost of these macro livestock animal are however very high in terms of housing, feeding, space requirement and disease control. On the other hand, micro livestock are cheaper sources of animal protein (Akinnusi, 1998). They include snails, rabbit and cane rats (Oji, 2000). Snails are invertebrates, shell bearing animal that are inactive during the day, but very active in the night and at dusk.

According to Akinnusi (1998) natural and emergence of pest and diseases increases shortage of food production in Nigerian which leads to food insecurity. This has resulted in malnutrition and associated human disease and the death of children and youth because they are mostly affected. But the poor lipid content of snail makes it to be about the only meat apart from fish to be recommended for a liver–diseased patient (Mogbo *et al.,* 2013). To attain the level of self-sufficiency in animal production, in order to meet the animal protein requirement by the people, the production of mini-wildlife, micro-livestock such as snails, grass cutter, bush fowl, giant rat, and rabbit must be stepped up.

Snails' meat is particularly rich in protein (Ajayi *et al.,* 1978). Imevbore and Ademosun (1988) indicated that snail's meat has a protein content of 898.37% (on dry weight basis) low total fat (1.64%), saturated fatty acids (28.71%) and cholesterol (20.28mg/100g) fresh sample. Snail meat is also rich in calcium, phosphorus and iron with value of 185.70mg/100g, 61.24mg/100g and 45-50mg/kg, respectively for dry sample (Ademola *et al.,* 2004).

Snail is easy and cheap to produce, it does not require much capital, therefore small amount of money is needed and it requires a small piece of land for production. The state of Nigeria economy akin to inadequacy of food, including animal protein calls for a great attention in the increase of meat production through wildlife management in which heliculture is one of the solution to the increment in animal protein.

Plantain is an excellent source of calcium, potassium, vitamins and other body building and nourishing nutrients (Kumar *et al.,* 2012). Plantain peel is one of the non-conventional feedstuffs; its nutrient potentials have not been exploited. It is known to contain reasonable amount of minerals, vitamins, carbohydrates, and little protein. Its nutritional quality could make it an obvious alternative to other feedstuffs considering the energy value. Therefore, the study is aimed at was determining the productive potentials of *Archachatina marginata* (Swaison) fed with different levels of plantain peels-meal (PPM) based diets.

METHODOLOGY

Experimental Site

The experiment was carried out at the Agricultural Extension and Management Teaching and Research Farm, Federal College of Forestry, Jericho, Ibadan, Oyo State. The college is situated at Latitude 70º5'11''N longitude 30º9'11''E, the climatic condition of the area is tropical with an annual rainfall range of 1430mm-2000mm.

Experimental set up and Management

Twenty-seven (27) juveniles of giant African land snails *Archachatina marginata* were used for the experiment. The snails were purchased from Oje market in Ibadan. The snail on arrival were put in an already prepared cage that have been covered with wire gauge and chicken net containing pawpaw leaves in each pen with loamy soil to ensure adequate moisture content. Feeding troughs were used to serve their feed. Feed intake was recorded by subtracting the left over from the feed served. Shell length, shell circumference and oval groove were measured on a weekly.

Experimental Design

The experimental design was completely randomized design (CRD). A total of twenty seven snails were subjected to three dietary treatments. There were 3 replicates per treatment and each replicate had three snails. The control was designated as T_1 while T_2 and T_3 represented the diets with plantain peel at 50g and 100g, respectively.

Data Collection

Feed offered was weighed and recorded per week and the left over was measured.

Feed Intake: The quantity of feeds eaten by snail per treatment was determined weekly by subtracting the quantity of feed left in the trough from the total feed given.
Thus:

$$Feedintake = \frac{Quantitygiven(g) - Quantityleft\ (g)}{7\ days}$$

Feed Efficiency: Was calculated using the formula;

$$Feedefficiency = \frac{Weightgain\ (g)}{Feedintake\ (g)}$$

Similarly, the same methods were used to determine the weekly and total quantity of feed eaten per snail throughout the experimental period.

Body Weight Gain: The body weight gain was determined weekly and was calculated by subtracting the weight of each replicate. Thus,

$$BodyWeightGain = Final\ Wieght(g) - Initial\ Weight\ (g)$$

Shell Length: This was measured by using a thread and ruler to measure from the tip to the groove of each snail, the summation per replicate was divided by three to get the average.

Shell Circumference: This was calculated by using thread and ruler to measure the circumference of each snail in a replicate. The total sum three snails that constituted a replicate were divided by three to have the common average of the shell circumference.

Groove Diameter: the groove diameter was measured by using thread and ruler to measure ventrally the length of the groove. The individual reading were summed together and divided by three for each replicate weekly.

Statistical Analysis: data generated were subjected to one-way test (Analysis of Variance ANOVA), using Statistical Package for Social Statistics (SPSS) and test for the mean using Duncan Multiple Range Test.

RESULTS AND DISCUSSION

Table 1 shows the percentage treatment combinations used in the experiment while Table 2 shows the proximate compositions of maize and plantains peel meals used in the feeds. The maize concentrate used has crude protein content of 10% while PPM had 10.64% , crude fibre 2.70% verse 5,782% either 4.00% vs 9.57% , Nitrogen extract 75.80% vs 62.14%, and ash 1.3% vs 12.83%.

Table 1: Percentage Composition of Experimental Diets

	T_1 0%	T_2 50%	T_3 100%
Maize white	22.00	11.00	0.00
Plantain peel	0.00	11.00	22.00
Wheat bran	12.20	12.20	12.20
Brewer dry grain	10.00	10.00	10.00
Fish meal	4.00	4.00	4.00
Soya bean meal	24.20	24.20	24.20
Groundnut cake	10.00	9.50	9.00
Bone meal	2.30	2.30	2.30
Premix-Grower	0.40	0.40	0.40
Limestone	9.80	9.80	9.80
Palm kernel cake	5.10	5.10	5.10
Total	100.00	100.00	100.00
Calculated analysis			
Crude protein	18.00	17.22	16.84
Crude fibre	5.27	6.13	6.88
M.E (Kcal/kg)	2600	2580	2486

Table 2: Proximate Composition of Maize and Plantain Peels Meals

Composition	Maize	PPM*
Crude protein	10.0	10.64
Ether extract	4.00	9.57
Crude fibre	2.70	5.82
Nitrogen free extract	75.80	62.14
Ash	1.3	12.83

Table 3 shows the performance characteristics of *Archachatina marginata* fed with plantain peel meal-based diets. There were significant ($P<0.05$) differences among the treatment means in terms of the average final weight, average weight gained, feed intakes as well as dressing percentage. Snails of treatment 3 had the highest absolute value (286g) when compared with 256.00g and 244.00g recorded for treatment 2 and 1, respectively. The value (286.00g) could be as a result of the presence of the plantain peel at 100%, which connotes with Adeolu and Enesi (2013) that plantain wastes can be sources of nutrients in animal feed preparation, as they are high in protein, fibre and essential mineral content. Also snails of treatment 3 recorded better weight gain over others, this could also be a reflective indicates of better consumption of the diets. More feed was consumed by snails of treatments 3.

The presence of plantain peel at 100% level of in conclusion could have led to the dilution of the feed and lesser nutrient utilization opportunity to the snails. This agrees with the work of Jayeola, (2010), which reported improvement in feed intake of *Archachatina marginata* fed with *Jatropha curcas* meal, Telfaria leaf meal and *Assystesia gigantic*. At a low energy plane, animals eat more feed to meet up with energy need of the bodies. Although, treatment 3 had more fiber, it was consumed more because of the energy-body equilibrium. This result had also manifested in lesser dressing percentage of snails of treatment 3 (32.42%) comparable to 38.72 and 36.22% respectively for treatments 2 and 1. However, the similarities in shell length, groove diameters, shell circumference, obtained among the snails, seemingly showed positive progression. This could be as a result of high fiber in their diets, as snails prefer less fibrous diets.

Table 3: Performance of *Archachatina marginata* Fed with Plantain Peel Meal-Based Diets

Parameter	T_1	T_2	T_3	SEM
Av. Initial wt (g)	106	106	107	5.54
Av. Final wt(g)	244^{c}	256^{b}	286^{a}	8.03
Av. wt gain(g)	138^{c}	150b	179^{a}	6.73
Av. Feed intake(g)	115.00^{ab}	115.00^{ab}	117.00^{a}	12.01
Feed efficiency	0.12	0.13	0.15	0.01
Av. Shell length (cm)	12.4	12.5	12.6	0.08
Av. Grove diameter (cm)	7.70^{b}	7.70^{c}	8.10^{a}	0.04
Av. Shell circumference (cm)	180.0^{b}	17.8^{c}	18.5^{a}	0.15
Av. Visceral weight (g)	16.91	15.58	16.78	1.41
Av. Discarded shell (g)	26.68^{a}	25.78^{b}	26.28^{a}	1.05
Av. Dressing %	36.22^{b}	38.72^{a}	32.42^{a}	1.54

abc means on the same row with different superscript are significantly different ($p<0.05$) at 5%
SEM = Standard error of mean, Av = Average, wt = weight, g = gram, cm = centimeter

Table 4 shows the sensory evaluation of meat samples for *Archachatina marginata* fed with plantain peel meal-based diet. There were significant differences in terms of all parameters assessed. Meat samples of snail fed with diet 3 had the highest rating of 4 for flavour and overall acceptability. This agrees with the work of Jayeola (2010). The result derived from treatment 3 snails could also be attributed to the influence of minerals and vitamins mostly iron that must have influence the diets. Plantain peels especially the ripped ones has remarkable amount of vitamin C, which might have acted as sweetener in the diets.

Table 4: Sensory Attributes of Meat Sample of *Archachatina marginata* Fed with Plantain Peel Meal –Based Diets

Parameters	T_1 0%	T_2 50%	T_3 100%	SEM
Flavour	2.00ab	3.00ab	4.00a	0.40
Juiciness	1.00	1.00ab	3.00a	0.48
Tenderness	1.00	1.00	1.00	0.001
Overall acceptability	3.00ab	3.00ab	4.00a	0.25

CONCLUSION

The inclusion of plantain peel as a replacement for maize in the diets of *Archachatina marginata* influenced the final weight, weight gain, feed intake, shell length, groove diameter, shell circumference and feed efficiency. The highest final weight (286.00g) by snails fed with diet 3 was at 100% PPM replacement level, followed by those of T_2 (256.00G) and T_1 (244.00g), respectively. Treatment 2 gave more yields over others. The palatability test revealed that meat samples of treatment 3 had the most satisfactory ratings in terms of flavour and overall acceptability indicating that PPM positively influenced the meat qualities of the experimental snails.

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