Open Access Research Journal of
Biology and Pharmacy
Journals home page: https://oarjbp.com/
ISSN: 2782-9979 (Online)

OARJ OPEN ACCESS RESEARCH JOURNALS

(RESEARCH ARTICLE)

# Effect of replacing maize with plantain peels on the performance traits and haematological characteristics of African giant land snail

Yeigba, B Japhet *, Kpun, IP and Birigeni, D Charity

*Department of Animal Science, Faculty of Agriculture, Niger Delta University Wilberforce Island Bayelsa State, Nigeria.*

Open Access Research Journal of Biology and Pharmacy, 2022, 04(01), 001–006

Publication history: Received on 21 November 2021; revised on 01 January 2022; accepted on 03 January 2022

Article DOI: https://doi.org/10.53022/oarjbp.2022.4.1.0058

## Abstract

The study was carried out at the Niger Delta University, Faculty of Agriculture Teaching and Research Farm, Bayelsa State. A total of Ninety six (96) growing snails (*Archachatina marginata*). Using Plantain peel as an additive, four diets were formulated at the levels of 0%, 3%, 6%, and 9% to form the treatment diets. The experiment lasted for eight (8) weeks during which the weight gain, feed intake, shell width, shell length, shell thickness and hematological parameters were obtained. The weight gain, shell width, shell length and shell thickness are not significantly different ($p<0.05$) whereas, the feed intake differed significantly ($p<0.05$) for all the treatment diets in the experiment. From the results, it was concluded that concentrate with 0% inclusion of Plantain peel meal was suitable for snail diets as it gave the best performance. The hematological parameters measured in the African giant land snails are White blood cell, Neutrophile and Lymphocyte differed significantly ($p<0.05$). Plantain peel can serve as source of potassium for other animals, as the highest percentage of potassium was found in the hemolymph of snails fed with 9% inclusion of plantain peel. It is recommended that; there should be no inclusion of plantain peels in the diet of the African giant land snails in order to achieve higher weight gain and feed intake.

**Keywords:** African giant land snail; Plantain peels; Maize; Performance trait; Haematological characteristics

## 1. Introduction

The importance of protein in the diet of man cannot be over-emphasized. Protein is required for normal growth and repair of body tissues (1). Protein can be of plant or animal origin. Most plant proteins are deficient in one essential amino acid or the other and may be associated with anti-nutritional factors. Soyabean for instance is a vegetable protein source that contains trypsin inhibitor and is deficient in methionine (1). Animal protein is of high biological value and possesses all the essential amino acids in desirable quantities. Sources of animal protein are the products (meat, milk, eggs) of macro and micro livestock. Macro livestocks are large farm animals such as cattle, goat and sheep (1). The cost of production of these animals are however, very high in terms of housing, feeding, space requirement and disease control. On the other hand, micro livestocks are cheaper sources of animal protein (2). They include snails, rabbits and cane rats. Snails are invertebrate, shell bearing animals. Snail meat tastes good and it is considered a delicacy in most cultures in Nigeria and they command high demand in the market, nowadays, the snail is being reared and gathered for its value in both rural and international markets. Snail meat is particularly rich in protein (Ajayi *et al*., 1978). (4) indicated that snail meat has a protein content of 88.37% (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, phosphorous and iron with values of 185.70mg/100g, 61.24mg/100g and 45-50mg/kg, respectively for dry samples (5) as well as the amino acids, lysine, leucine, isoleucine and phenylalanine (4; 6; 5).

* Corresponding author: Yeigba B Japhet
Department of Animal Science, Faculty of Agriculture, Niger Delta University Bayelsa State, Nigeria.

Snail farming can conveniently be done in our back yards. This is due to the fact that snail farming is environmentally friendly and can be done with little skill (6). The faecal matters neither smell nor make the environment filthy in any way. Snails are also good converter of vegetable protein to useful animal protein (6). They provide a very cheap source of high quality animal protein for human consumption. Snail farming is also a high profit-yielding venture and requires little capital when compared to other forms of animal farming. Thousands of land Snails can be raised in a small land space if intensively managed and there is always less need for vaccination and therapeutic drugs (4). Predators, parasites, and disease can easily be prevented through proper housing, management, and sanitation. These comparative advantages over other livestocks should be used as an edge to increase snail production. Snail meat competes favorably with poultry egg and flesh in essential amino acids and digestible protein (7). It is essentially rich in lysine, leucine, isoleucine, phenylalanine, arginine and tryptophan and contains high level of iron, calcium and phosphorus (4). The galacton present in its abdominal gland serves as a medicinal substance of high immunological value, which cures tuberculosis, ulcer, asthma and circulatory disorders. (7) also pointed out that snail meat is useful in the treatment of some human diseases like anaemia, hypertension, asthma, etc. while its shell can be used in the production of buttons, rings and other jewelry. It is unequivocally clear that the importance of improving snail production cannot be overemphasized.

## 2. Material and methods

### 2.1. Location and Duration of Study

The experiment was conducted at the Snailery Unit of the Department of Animal Science at the Niger Delta University, Faculty of Agriculture Teaching and Research farm, Wilberforce Island, Bayelsa State.

Bayelsa is a state in southern Nigeria in the core Niger Delta region, between Delta State and Rivers State. Bayelsa State is geographically located within Latitude 4° 15′ North and latitude 5° 23′ south and longitude 4° 22′ West and 06° 45′ East, (Wikipedia). It shares boundaries with Delta State on the North, Rivers State on the East and the Atlantic Ocean on the West and South. Bayelsa lies within the heaviest rainfall area in Nigeria, with heavy rain forest and a short dry season (usually from November to March). The mean monthly temperature is in the range of 25°C to 31°C. Mean maximum monthly temperatures range from 26°C to 31°C, (Wikipedia). The mean annual temperature is uniform for the entire Bayelsa State. The hottest months are December to April. The Relative humidity is high in the state throughout the year and decreases slightly in the dry season. The duration of the experiment was Eight (8) weeks.

### 2.2. Experimental Animal and grouping

Ninety six (96) African giant land snails (*Archachatina marginata*) were used in this experiment. The snails were purchased from Yeigba Integrated Farms Nigeria Limited in Okolobiri Town, in Yenagoa local government area of Bayelsa State, Nigeria. Ninety six (96) snails were used for the study, twenty four (24) snails were used for each of the four (4) treatments, while eights (8) snails were used for each of the three (3) replicate.

### 2.3. Preparation of Experimental Diet

The unripe plantain (*Musa paradisiaca*) peels were collected from different plantain vendors in Sabagreia Town of Kolokuma /Opokuma local government area, Bayelsa state. The unripe plantain peels were aired and sundried for few days depending on the weather condition, and was later grinded into powdery form with a grinding machine, after which the powder was stored in a sac bag till when needed.

Graded level of plantain (*Musa paradisiaca*) peel meal were used at the rate of 0%, 3%, 6% and 9% in the dietary treatments designed as T1, T2, T3 and T4 respectively while treatment one (T1) served as control diet containing (0%) plantain (*Musa paradisiaca*) peel meal.

### 2.4. Management of Experimental Animal

#### *2.4.1. Acclimatization of Experimental Animal*

The acclimatization period (pre-experimental period) lasted for one week, throughout this period the snails were kept under same management pattern were feed and water were given to the snails *ad libitum*. The feed were moistened before supply to allow for easy ingestion and to prevent respiratory difficulty that can be caused by dusty feed (Omoyakhi and Osinowo, 2010). This process will enable the snails to adapt to the environment.

*2.4.2. Housing*

The snails were housed in plastic baskets measuring 30cm in length and 13cm in width. The baskets were properly perforated for easy movement of air, in and out of the basket. The baskets were also filled with treated loamy soil to get rid of harmful soil microorganism. The soil was moistened regularly to keep favorable humidity for snail growth.

*2.4.3. Sanitation*

Fresh feed that is free from mould were given to the snails every day. Left over feed were removed from the feeding trough. Clean water was supplied to them. The plastic trays used for feed and water supply were cleaned and washed each day before placing feed or water. Their faeces were scooped out of the basket to prevent microbial infestation.

### 2.5. Data Collection /Parameters measured

Data were collected on growth performance and feed intake by measuring the following parameters.

### 2.6. Determination of Body Weight

The body weights of the snails were measured on the first day and subsequent weights were taken every week until the end of the experiment. The weights were measured with a weighing balance.

### 2.7. Shell Length and Width

Snails were randomly selected from each of the treatments to measure shell increment (length and width), with the use of vernier caliper to the nearest millimeter.

### 2.8. Feed Intake

Feed intake was obtained by deducting the remnant feeds from the initial feed given to the snails on daily basis and records were taken.

### 2.9. Shell Thickness

Snails were selected from each of the treatment to determine the shell thickness, with the use of a vernier caliper.

### 2.10. Proximate and Mineral Composition of Plantain Peel Meal

The plantain peel was subjected under proximate analysis after been sundried and grinded into powdery form in other to acquire the proximate and mineral composition of the plantain peel meal before it was been used for the experiment.

### 2.11. Mineral Composition of the Haemolymph of the African Giant Land Snail

After the completion of the eight (8) weeks experiment, snails were randomly collected from each of the treatments and the Haemolymph which is a bluish fluid found in snails, that is equivalent to blood was collected from the snails by de-shelling the snail. The Haemolymph of the snail was subjected under mineral analysis in other to acquire the mineral content of the Haemolymph of African Giant Land Snail fed Plantain peel meal.

**Table 1** Gross Composition of Experimental Diets

| Ingredients | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Maize | 35 | 32 | 29 | 26 |
| Plantain peel meal | 0 | 3 | 6 | 9 |
| Soya Bean Meal | 21 | 21 | 21 | 21 |
| Wheat Offal | 15 | 15 | 15 | 15 |
| Palm Kernel Cake | 14.25 | 14.25 | 14.25 | 14.25 |
| Crayfish Meal | 3 | 3 | 3 | 3 |
| Bone Meal | 5.5 | 5.5 | 5.5 | 5.5 |
| Oyster Shell | 6 | 6 | 6 | 6 |
| Premix | 0.25 | 0.25 | 0.25 | 0.25 |
| TOTAL (100%) | 100 | 100 | 100 | 100 |

## 3. Results

**Table 2** Proximate composition of Plantain peel meal

| Parameters | % |
|---|---|
| Moisture | 5.78 |
| Dry matter | 94.22 |
| Total Ash | 0.725 |
| Crude Protein | 5.637 |
| Lipid | 0.427 |
| Fibre | 2.365 |
| Nitrogen free extract | 85.066 |

**Table 3** Mineral content of Plantain peel meal

| Parameters | (mg/100) |
|---|---|
| Calcium | 18.28 |
| Magnesium | 4.284 |
| Sodium | 12.78 |
| Potassium | 28.57 |
| Iron | 4.96 |
| Manganese | 6.86 |
| Copper | 3.76 |
| Zinc | 30.64 |
| Phosphate | 73.46 |

**Table 4** Mineral content of African Giant Land Snail hemolymph fed plantain peel

| Parameters | T1 (0%) | T2 (3%) | T3 (6%) | T4 (9%) |
|---|---|---|---|---|
| Calcium(mmol/L) | 5.1 | 5.1 | 4.7 | 5.0 |
| Potassium(mmol/L) | 16.0 | 8.3 | 16.0 | 16.9 |
| Glucose(mmol/L) | 0.41 | 0.55 | 0.51 | 0.71 |

**Table 5** Mean performance characteristics of African giant land snail fed Plantain peel meal

| Parameters | T1 (0%) | T2 (3%) | T3 (6%) | T4 (9%) |
|---|---|---|---|---|
| Feed intake (g) | $91.00 \pm 0.56^{a}$ | $83.26 \pm 4.00^{a}$ | $70.52 \pm 1.41^{b}$ | $67.32 \pm 1.99^{b}$ |
| Weight gain (g) | $10.30 \pm 1.58$ | $7.98 \pm 3.91$ | $9.66 \pm 0.99$ | $9.23 \pm 0.79^{ns}$ |
| Shell length (cm) | $7.70 \pm 0.18$ | $7.93 \pm 0.07$ | $7.87 \pm 0.17$ | $8.255 \pm 0.20^{ns}$ |

| | | | | |
|---|---|---|---|---|
| Shell width (cm) | $4.28 \pm 0.16$ | $4.29 \pm 0.09$ | $4.30 \pm 0.05$ | $4.37 \pm 0.09^{ns}$ |
| Shell thickness (cm) | $0.10 \pm 0.00$ | $0.10 \pm 0.00$ | $0.10 \pm 0.00$ | $0.10 \pm 0.00^{ns}$ |
| Mortality | $0.00 \pm 0.00$ | $0.33 \pm 0.33$ | $0.00 \pm 0.00$ | $1.00 \pm 1.00^{ns}$ |

Subscript a, b of same column with different superscript differ significantly ($p < 0.05$)
NS = Not Significant

**Table 6** Hematological parameters of African giant land snail hemolymph fed Plantain peel

| Parameters | T1 (0%) | T2 (3%) | T3 (6%) | T4 (9%) |
|---|---|---|---|---|
| White blood cell | $1.25 \pm 0.05^{b}$ | $1.35 \pm 0.05^{ab}$ | $1.50 \pm 0.00^{a}$ | $1.35 \pm 0.05^{ab}$ |
| Neutrophile (complete) | $36.00 \pm 0.00^{a}$ | $27.00 \pm 1.00^{b}$ | $30.50 \pm 0.50^{b}$ | $31.00 \pm 1.00^{b}$ |
| Lymphocyte (complete) | $64.00 \pm 0.00^{b}$ | $73.00 \pm 1.00^{b}$ | $69.50 \pm 0.50^{a}$ | $69.00 \pm 1.00^{a}$ |

Subscript a, b of same column with different superscript differ significantly ($p < 0.05$)

*Archachatina marginata* are not just nocturnal feeders but they feed well when the humidity is appropriate for them which means that the time of feeding depends on the relative humidity of their surroundings, this observation supports the findings of (8).

Table 4.4 shows the performance of African giant land snails fed plantain peel meal, which indicates that the T1 snails fed with 0% inclusion of plantain peel meal had the highest feed intake followed by T2, T3, T4 which was fed 3%, 6% and 9% respectively. The snails fed with 0% inclusion of plantain peel meal also had the highest weight gain followed by T3, T4 and T2. (9) and (10) stated that there is reduction in feed intake and weight gain, when maize was substituted with plantain peel. Possible reason for the reduction in weight gain across graded levels of plantain peel meal were associated with the presence of the following anti-nutritional factors; tannic acid, phytic phosphorous, oxalate and saponin in plantain peels as highlighted by (8). The significant reduction in the feed intake in the diet with 9% plantain peel meal compared with other plantain peel diets conforms to the report of (9) who reported a decrease in feed intake with increasing percentage of plantain peel, resulting to the change in the taste of the (10). Table 4.3 shows the mineral content of African giant land snail hemolymph fed plantain peel meal, which indicates that T1 and T2 had the highest value in calcium content followed by T4 and T3 respectively, while T4 had the highest value in potassium and glucose content followed by T3, T1 and T2. Table 4.5 show the hematological characteristics of the African giant land snail Haemolymph fed plantain peel meal, which indicates that the values of the White blood cell, Neutrophile and Lymphocyte in all treatments differs significantly ($p<0.05$).

## 4. Conclusion

The study established that 0% percentage inclusion of Plantain peel in the diet of *Archachatina marginata* influenced the final weight, weight gain and feed intake positively as it has the highest final weight, feed intake and weight gain.

The Haemolymph of *Archachatina marginata* fed with 9% inclusion of Plantain peel has the highest percentage of potassium.

### *Recommendation*

It is recommended that there should be no inclusion of Plantain peel in the diet of *Archachatina marginata* in order to achieve higher weight gain and feed intake.

The plantain peels were rich in potassium and can be a good source of this mineral for the production of other animal feeds, and their utilization for this purpose should be encouraged as this will also help in reducing the menace of plantain wastes in the environment.

## Compliance with ethical standards

### *Acknowledgments*

I acknowledge Mr and Mrs Bolouinbele Yeigba and all staff in the Department of Animal Science, Niger Delta University.

*Disclosure of conflict of interest*

No conflict of interest.

## References


[1] Jurgens, MH, Animal feeding and nutrition, 2002 (9th ed., pp. 144-146). *Kendall/Hunt Publishing CO., Iowa,* USA.

[2] Akinnusi O, Introduction to Snail Farming. *Omega Science Publisher*, 1998. Tinuoso House, Lagos, Nigeria.

[3] Ajayi, SS, Tewe OO, Moriarty, C, and Awesu, MO, Observation on the biology and nutritive value of the African giant snail (*Achachatina marginata*). *Journal of East African Wildlife*, 6(2): 90-100. 1978.

[4] Imevbore, EA, Management techniques in rearing African giant land snail *Archachatina marginata* P.H.D Thesis, University of Ibadan, Nigeria, 1990.

[5] Ademolu, KO, Idowu, AB, Mafiana, CF, and Osinowo, OA, Performance, proximate and mineral analyses of African giant land snail (*Achachatina marginata*) fed different nitrogen sources. *African Journal of Biotechnology* Vol. 3 (8) pp 412-417, August, 2004.

[6] Steivenart, C, Observation on shell lip formation and reproduction in the giant African snail (*Archachatina maginata*) *Snail Farming Research*, 4: 20-29, 1992.

[7] Okonkwo, AG, Isaac L.J, Nkanga I, Usoro OO, Effects of various feeding regimes on the performance of snails (*A. marginata*). *A Paper Presented At 25th Annual Nsap Conference*, March 19-23, Umudike, Nigeria. Pp: 314-315. 2000.

[8] Akinnusi O, Introduction to Snail Farming. *Omega Science Publisher*, Triolas Pulblishing Company, Abeokuta, Pp. 70. 2002.

[9] Ajasin, FO, Omole, AJ, Oluokun, JA, Obi, OO and Owosibo, A. Performance characteristics of weaned rabbits fed plantain peel as replacement for maize. W.J. Zoology 1: (1) 30-32. 2004.

[10] Omole, AJ, Ajasin, FO, Oluokun, JA, and Obi, OO. Performance characteristics of weaned rabbits fed plantain peel as replacement for maize. *Journal of Nutrition and Food Science,* 38:559 – 563. 2008.