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Research Paper

EFFECTS OF NATURAL AND CONCENTRATE DIETS ON PROXIMATE COMPOSITION AND SENSORY PROPERTIES OF GIANT LANDSNAIL (*Archachatina marginata*) MEAT

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Abstract: Natural food of potato leaf (*Ipomea batava*) and formulated concentrate feed were fed on twenty giant land snail (*Archachatina marginata*) with average weight of 113±1.06g for twelve weeks to determine the effects of these diets on proximate composition and sensory properties of the experimental snail species. At the end of this experiment, it was discovered that experimental snails fed compounded concentrate were higher in protein (25.68%), Na (17.5% mg/100g) and Ca (188.5mg/100g) than those fed *Ipomea batava*. The sensory properties of the snails fed two diets were not significantly differs ($p>0.05$) in terms of colour, flavour and texture while the meat taste, and general acceptability of snails fed natural potato leaf was rated highest.

Keywords: *Archachatina marginata*, feeds effect, meat quality

INTRODUCTION

Access to diet has been a major problem of the people in the developing countries of the world including Nigeria. The diet of an average Nigeria household is mainly carbohydrate based with a deficiency of protein particularly protein of animal origin. The average daily animal protein of Nigerians been rated among the lowest in the world Omole [1] of which its effects according can be manifested inform of increased malnutrition and malnourishment.

In the contemporary dispensation of developing countries where food insecurity, economic meltdown, and environmental problems are predominant, animal protein of high quality are by far

on the table due to high price than its plant counterpart which many within the poverty-line cannot afford. Animal protein which is of higher quality than the plant protein is by far more expensive than the plant protein.

Apart from the fact that snails belong to micro-livestock that requires little investment to produce or establish, its meat contains high quality protein and essential amino acid which could be used as supplement to the present protein requirement obtained from livestock [1] and meat compared favourably with other livestock species such as beef, broiler, goat and fish most especially of its protein content [2]. In Nigeria, *Ipomea batata* are majorly valued for its tuber and very scanty report available on the economic importance of its leaves relating to snail sensory properties. This study evaluates the effects of two different food sources on the proximate composition and sensory properties of edible giant land snail (*Archachatina marginata*) meat.

MATERIALS AND METHODS

The study area

This study was carried out at the Federal University of Technology, Akure in Ondo State of Nigeria. Akure is the capital city of Ondo State and also the headquarters of Akure Local Government situated at 204km east of Ibadan in Oyo State, 168km west of Benin City in Edo State and 311km north-east of Lagos State.

The state is a low land tropical rain forest with an average annual rainfall of about 1613mm per year and an annual mean temperature of about 27°C. The dry season occurs between November and March while the rainy season is from April to October annually. Harmattan occurs in this area between late December and early January of each year as a result of the hot, dry and dusty trade wind. (*i.e.* North east trade wind trade wind) which blows across the Sahara desert.

Forty (40) giant land snails of almost equal size were purchased from the King's market (Oja-Oba) in Akure. They were watered and stocked inside separate cage net to acclimatize them for twenty days at the Wildlife Domestication Unit of the Department of Fisheries and Wildlife, Federal University of Technology, Akure, Ondo State.

Thirty snails of balanced weight from forty snails were randomly selected into two treatments of five snails per treatment and replicated in three places at the end of acclimatization and marked on their shells for proper identification (T_{I^a} , T_{I^b} , T_{I^c} and T_{II^a} , T_{II^b} , T_{II^c}).

Experimental diets

Treatment I was made of natural diet of potato leaf (*Ipomea batata*) collected from the Federal University of Technology Research Farm while treatment II was made of compounded concentrate prepared from the locally available feed ingredient purchased from the feed mill within Akure Township. The proximate compositions of the two experimental diets were presented in Table 1 and 2 respectively.

Experimental site

The snail's cages were kept in a rectangular house with dimension 9m x 8m x 3m. This enclosure is made of concrete up to about 1.5m of its four sides. The remaining portion of the house was netted with wire mesh of 1cm in diameter and fine wire netting material of 2mm diameter to keep off predators. The roof of this structure, apart from being covered with wire mesh and mosquito netting materials was also covered with iron roof and palm trees, creeping or climbing plants like *Xanthisoma* species were planted around the snail house to provide cool and semi natural environment.

The snail cage

The snail cages are made of wooden frames of dimension 60 x 45 x 180cm³ divided into 8 segments. These segments were used to hold each of the two treatments and control animals in two replicate.

The cage was supported by the aid of a metal frame off the ground to prevent the attack of predators such as termites and soldier ants into the cages. The outer part of the cage was covered with a black poly sheet over – laid with a mosquito net and a 1cm diameter wire gauze net size to keep off predators as well as to a good climatic condition such as temperature and light control within the cages as snail perform best under a nocturnal environment, Humus soil of 5cm deep is used to floor or bed for the snails.

Cleaning and feeding of experimental snails

The soil media (top soil) used was collected from the nearby undisturbed area; the soil was air-dried and sieved before laid into the experimental snail cage. Cleaning was done first in the morning throughout the experiment. The snails were fed with the experimental diets and water supply ad-libitum till the termination of the experiment at the tenth week. The diet chemical analysis was initially carried out to determine its composition using the method described by Association of Official Analytical Chemist [3].

Experimental Snails Processing

Six experimental snails from each treatment were randomly selected (two snails per replicate) and killed by striking the shell with an iron rod on the tenth week of the experiment. The edible portion (i.e. the food), the viscera, shell and fluid were separated. The edible portion of individual life of the treatment, were washed separately with lime and then boiled with 200mls of water while 0.5gms of salt was added for taste as recommended by Ashaye *et al.* [4] before they were separately fried in hot groundnut oil for about 2 to 3 minutes in accordance to Amusan and Omidiji [5].

The Sensory Evaluation

Ten judges with vast taste of snail were chosen for this exercise; pieces of fried snail of 20g were placed inside flat white enamel plate and labeled using code that is unknown to the judges. The snails' samples were assessed for colour, taste, flavor, texture and general acceptability. Table water was provided for the judges to rinse their mouth after each assessment and score were based on a five point hedonic scale basis from 1 dislike extremely to 5 like extremely according to Larmond [6].

The proximate analysis of the flesh (Meat part)

Also at the end of the tenth week of experiment, six experimental snails were randomly selected again from each treatment (two snails per replicate) and strike with an iron rod to remove the shell. The edible portions (i.e. the food) of individual life of the treatment were subjected to chemical analysis on dry matter basis using A.O.A.C.[3].

Parameters measured

1. Chemical composition of the feed.
2. Sensory evaluation of the edible portion of the experimental snail at the tenth week.
3. Chemical composition of the edible portion on dry matter basis on the tenth week.

Statistical analysis

The data was analysed using a one way analysis of variance (ANOVA). Significant differences between the means were determined using the LSD test [7].

RESULTS AND DISCUSSION

Table 1 shows that natural food used as experimental diet that is potato leaf (*Ipomea batata*) had highest percentages fibre (13.69%), ash (6.41%) and moisture content (24.32%) while the formulated diet recorded higher proportion in protein (9.10%), fat (6.34%), Nitrogen Free Extract (69.21%) and Dry Matter (78.39%).

Table 1: Proximate composition of the experimental diets

	%C. Protein	%C. Fibre	%Fat	%Ash	%NF	%DM	%M.C.
Potato leaf	7.55	13.69	3.20	6.41	69.15	75.68	24.32
Formulated diet	9.10	11.20	6.34	3.87	69.21	78.39	21.61

There are no significant different ($P < 0.05$).

Proximate composition of flesh (meat) of snail fed with potato leaf (natural) and formulated diet (Table 2). The result shows that the compounded diet was richer in nutrient than the natural diet potato leaf, also as result the compounded feed will make the animal to perform better especially in area of reproduction.

Table 2: Proximate composition of snail meat, fed with experimental diets

	E.E.%	AC%	CP%	MC%	CHO%	NFE mg/100g	Na mg/100g	K mg/100g	Ca mg/100g
Natural Diet	1.5	13.84	17.84	77.6	1.70	76.36	16.0	25.6	186.5
Formulated diet	1.39	3.69	25.68	75.05	1.98	79.34	17.5	27.0	188.0

The crude protein content for formulated diet is 25.68% which is higher than natural diet, this supported Rebecca *et al.* [8], that a well formulated feed can be used in sundry to increase yield production and better quality. Probably chicken feed and broiler finished can be used. Na, Ca and K content of formulated diet are high than those of natural diet. This result is in line with the finding of Ashaye *et al.* [4] that snail are rich in mineral content which can be used in reducing the problem of rickets in children and for good bone formation when snail is consumed.

Sensory evaluation indicates no significant differences between the colour, flavour and texture of the two diets. However, taste and general acceptability of natural fed snail meat were rated significantly higher than compounded fed snail meat.

Table 3: Sensory Evaluation of fried snail

	Colour	Taste	Flavour	Texture	General Acceptability
Score ESFND	5.8	6.9	5.8	5.4	7.0
Score ESFFD	5.2	6.0	6.9	6.0	6.4

Means in the same column are not significantly different at ($P < 0.05$) (The Authors dislike extremely to 5 like extremely)

CONCLUSION

It was revealed that compounded feed boosts *Archachatina marginata* growth and makes it meat richer especially in protein than natural food, although both are rich in minerals. Taste and general acceptability of both treatments were acceptable to the panel with little or no difference between natural food and compounded feed. This study concludes that more research work on the effects of *Ipomea batata* leaves inclusion on snail diets should be conducted so as to support large scale rearing of snail for economic growth.

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