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RESEARCH PAPER

Proximate and Mineral Analysis of Three Species of Snails Consumed in Edozhigi, Gbako Local Government Area of Niger State

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ABSTRACT

The proximate and mineral compositions of three species of edible snails (Pila globosa, Helix aspera and Archatina fulica) from Edozhigi village in Niger State were investigated using standard methods. The mineral composition of the snails was analyzed using Atomic Absorption Spectrophotometer (Buck Scientific, model 210 VGP). The results of the proximate analysis showed that the three species contain high moisture content (61.37% to 74.67%) and high protein content (18.38% to 20.35%) dry weight. The results of the mineral analysis showed the presence of Ca, Na, K, P, Cu, Mg, Mn, Zn and Fe in substantial amounts in all the three species. Results of this investigation revealed that the three species of snails could serve as a good alternative source of crude protein and essential minerals needed for healthy growth. The low lipid content of the snails could be an advantage in reducing high cholesterol levels.

Keywords: Proximate analysis, mineral composition, Snails, nutritional composition,

INTRODUCTION

Snails are among the members of the phylum *mollusca,* which are distributed across freshwater, seas and land **(**Cheney, 2008). The freshwater apple snails (*Pomacea sp.*), African giant land snails (*Archatina fulica*) and edible garden snails *(Helix aspersa*) are among the various species of snails commonly found in the Southern and other parts of Guinea Savannah in Nigeria where the atmospheric weather conditions and vegetation are favourable for their survival **(**Odaibo, 1997)**.** These creatures are the largest group of invertebrate animals which enjoy moist environments and are mostly herbivorous (Yoloye, 2006).

Snails are mostly available in large numbers during the rainy seasons and can be found easily at night. They can stand long period of drought in a dormant condition and buried in the mud during the period of their summer sleep. Snails generally exhibit sluggish movements over short distances which are dependent upon the temperature, food and nature of the soil. They are active during optimum temperature, humidity and moistened soils (Ebenso, 2002; Ebenso and Okafor, 2002 & Ebenso, 2003b). During their movement, these invertebrates produce unpleasant odour by the deposition of their saliva and faeces on the plants which distastes man and even herbivores from feeding on these contaminated plants **(**Ahmed and Nabil 2012)**.** Thus crops contaminated by snail slime lose their market values and consequent export potentials **(**Baker and Hawke, 1990 **&** Ittah and Zisman, (1992).

Snail meat has been reported to be highly nutritious because it contains the essential amino acid, rich in vitamins and minerals but low in fats and cholesterol. It is also reported that the land snail meat is very rich in protein which could be as high as 14.52% (Yusuf and Oseni, 2004). Other values like 12.87% and 12.2g/100g of protein have been reported for the garden and apple snails respectively. However, the nutritional composition of snail might vary depending on its feeding habits, species, and method of collection, location, season and sexual conditions. Data on the nutrient composition of edible Snails in Niger State is scanty, fragmentary and inadequate. A comprehensive data is therefore necessary. This work was therefore carried out to explore the

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nutritional potentiality of three species of Snails commonly consumed by the various communities of Edozhigi in Gbako Local Government Area of Niger State with a view to providing a baseline data and a reference point for further work on these cheap protein sources from other parts of Niger State.

METHODOLOGY

Sample collection and preparation:

The life snails (*Helix aspersa*, HA, *Pila globosa* PG and *Archatina fulica AF*) were harvested from different forests in Edozhigi village of Gbako Local Government Area of Niger State. They were thoroughly washed with detergent and rinsed with distilled water. The shells were cracked using stones so as to collect the fleshy part used for the analysis. The fresh meats were sun- dried and made into powder using mortar and pestle and were separately kept in dried plastic bottles at room temperature prior analysis.

Determination of proximate and mineral composition:

The proximate analysis of the three species of Snail samples for moisture, crude fat, crude fibre, protein and ash were carried out using the method described by AOAC **(**AOAC, 2000). The crude protein content was determined using micro Kjeldahl method described by Pearson and the Carbohydrate content was obtained by difference (Pearson, 1976). All the determinations were in triplicates.

Sodium and Potassium were determined using Gallenkamp flame photometer, while Iron, Magnesium, Zinc, Copper, Manganese and Calcium were determined using Atomic Absorption Spectrophotometer (Buck Scientific, model 210VGP). Phosphorus was determined using Phosphovanadomolybdate method using Jean Way Ccolorimeter (Model 6051) at 420nm (AOAC, 2005) and all the determinations were in triplicates.

RESULTS AND DISCUSSIONS

Table 1: Proximate composition (%) of dried meat from 3 different species of Snails

Parameter	*Helix aspersa*	*Pila globosa*	*Archatina fulica*
Moisture	70.20±0.01	74.67±0.02	61.37±0.01
Crude protein	19.26±0.01	18.38±0.01	20.35±0.01
Ash	2.50±0.01	1.00±0.01	4.00±0.001
Crude fibre	3.65±0.01	3.38±0.01	3.87±0.01
Lipids	0.51±0.01	2.07±0.01	0.37±0.01
Carbohydrate	2.92±0.01	0.38±0.01	2.24±0.01

Values are Mean ± SD of triplicate determinations

Table 2: Mineral composition (mg/kg) of dried meat from 3 different species of snails:

Minerals	*Helix aspersa*	*Pila globosa*	*Archatina fulica*
Ca	6577.00±0.01	2435.50±0.01	4905.50±0.01
Fe	77.00±0.01	96.50±0.01	50.50±0.01
P	4212.50±0.01	3716.00±0.01	3078.50±0.01
Mn	12.00±0.01	9.00±0.01	46.00±0.01
Mg	1952.00±0.01	4128.50±0.01	1478.00±0.01
Cu	19.50±0.01	59.00±0.01	9.00±0.01
Na	734.50±0.01	697.50±0.01	592.00±0.01
K	3078.00±0.01	3474.00±0.01	2334.00±0.01
Zn	22.50±0.01	26.00±0.01	17.50±0.01

Values are Mean ± SD of triplicate determinations

The result of the proximate composition of the three species of snails popularly consumed in Edozhigi is presented in Table 1. The moisture content of 74.67±0.01%,70.20±0.02% and 61.37±0.01% obtained from the snails (PG),(HA) and (AF) fall within the range of 73.67 to 99.20% reported by (Eneji, Ogogo, Emmanuel-Ikpeme and Okon, 2008). These values were lower than the value reported for *Pila globosa* (85.5%) found in Europe and Africa. These high moisture contents could affect the shelve life of the snail meat. The crude protein content of 18.38± 0.01%, 19.26±0.01% and 20.35±0.01% were obtained for PG, HA and AF respectively. These values fall within the range of value of 20.2% protein for snails which compares favorably with values obtained from other animal food protein sources such as chicken (20.5%), mutton (16.9%) and fish (22.7%) (F.A.O., 2001). These high values indicate that Snail meat could serve as a good source of protein. The fat content of 2.07±0.01%, 0.51±0.01% and 0.37±0.01% were found in PG, HA and AF respectively. The value 2.07±0.01% obtained for PG is higher than the value 0.06% obtained for *Pila globosa* (Obande, Omeji and Isiguzo, 2013). The value of 0.37±0.01% recorded for AF is lower compared to 0.82-0.95% for *Archatina fulica* (Hamzat, 2004). The fat contents of the snails are generally lower compared to 9.6%, 21.4% and 23.0% reported for egg, mutton and duck product **(**F.A.O., 2001). Such differences are not unusual considering the mode of feeding of snails and their habitat. The low lipid contents of the snails make them a good diet for low fat food requirement individuals and hence an anti-hypertensive remedy. The values of the crude fibre obtained for PG, HA and AF were 3.38±0.01%, 3.65±0.01% and 3.87±0.01% respectively, which are within the range of 0.50 to 1.50% for land and water snails (Eneji, Ogogo, Emmanuel-Ikpeme and Okon, 2008). The high fibre content in the snail meat can be used to compliment animal roughages.

The ash contents were generally low in the three species (1.00±0.01%, 2.50±0.01% and 4.00% for PG, HA and AF respectively). These values appeared to be lower than the reported values for *Pila globosa* (Obande, Omeji and Isiguzo, 2013) thus, indicating that snails are good source of minerals since the ash content of a material is a reflection of its mineral content.

Table 2 shows the mineral contents of the three species of snails. The results revealed that snail meat is rich in calcium and phosphorus with recorded values of 2435.50±0.01, 6577.00±0.01 and 4905.50±0.01mg/kg for calcium and 3716.50±0.01, 4212.50±0.01 and 3078.50±0.01 mg/kg for phosphorus in PG, HA and AF respectively. These values are higher compared to the reported values from the literature (129mg/100g Ca and 60.52mg/100g P), for *P. globosa* and (66.30mg/100g) Ca and (14.79mg/100g) P for (AF) **[15].** The iron contents were 96.50, 77.00 and 50.50mg/kg respectively. These values are higher compared to 6, 11.4, 0.1 and 1.9 mg/100g as obtained from kidney, milk and beef (Imevbore and Ademosun, 1998). The results of iron contents obtained for the samples showed that snails are good sources of iron and thus can balance the daily needs of pregnant and nursing mothers. The concentration of Mg, Na, K and Zn were also high in all the three species of snails. Considering the importance of these minerals for the normal functioning of the body, snail meat could serve as a good source of these essential minerals.

Conclusion

The results of this study have shown that snails are undisputable good source of animal proteins and other essential mineral nutrients. The consumption of the snail meat though mostly guided by traditions and culture plays a vital role in human nutrition. They can be reared for a subsidiary source of income and for their high nutritional potentials (Banjo, Lawal and Songonuga, 2005).

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