

Chemical composition of snail meat species (*Archachatina marginata* and *Achatina achatina*) in Odeda Local Government Area of Ogun State, Nigeria

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Abstract

The cost of procuring meat as an animal protein source in Nigeria is on the increase. There is therefore the need to source for alternative cheap source of animal protein that can serve the populace the nutritive value needed in the body system. The study was carried out to assess the proximate composition and mineral analysis of the two species of snail meat (*Archachatina marginata* and *Achatina achatina*) in Odeda Local Government Area of Ogun State Nigeria. The result revealed that snail meat (*Archachatina marginata* and *Achatina achatina*) were found to contain; 0.16g/100g and 0.18g/100g of Crude fibre, 1.43g/100g and 0.79g/100g of Ash content, 1.53g/100g and 0.88g/100g of Ether extract, 22.75g/100g and 11.92g/100g of Crude Protein, 0.09g/100g and 0.19g/100g of NFE (Nitrogen Free Extract), 74.06g/100g and 86.1g/100g of moisture content respectively while the mineral content of snail meat (*Archachatina marginata* and *Achatina achatina*) was found to be 1.216mg/g and 1.343mg/g of Phosphorus, 0.426mg/g and 0.438mg/g of Magnesium, 0.084mg/g and 0.093mg/g of Iron, 2.011mg/g and 2.046mg/g of Calcium, 1.934mg/g and 1.967mg/g of Potassium, 0.795mg/g and 1.000mg/g of Chlorine. The overall nutritional potential of the two species was quite good. These results show that these species of snail are highly nutritive. The findings were discussed in line with the importance and implication of the uses of edible land snail meat to man. It is therefore recommended that there is need to increase animal protein production in Nigeria and other developing countries of the world as a panacea to imminent problem of malnutrition.

Keywords: Giant African Land Snail, Proximate Composition, Mineral Analysis

Introduction

The two Giant African Land Snails common in Nigeria are *Achatina achatina* and *Archachatina marginata*. The snail is an invertebrate that has a soft body and a covering of hard shell. It is one of the micro livestock that has recently attracted attention among agriculturists in Nigeria as an aftermath of alarm raised by Food and Agricultural Organization (FAO) on animal protein deficiency among Nigerians (Adesope, 2000; Akinnusi, 2000). Giant African Land Snail is found in cool environment, in gardens, vegetable plantation, refuse heap, orchards, etc.

Animal proteins are of better quality than plant proteins due to their higher biological value. In particular, cereal proteins are low in Lysine which is therefore called the limiting amino acid because it is the one most below human requirement. The shortfall in the protein intake of many Nigerians could be achieved by revitalizing some of our wildlife species such as snails, rodents, antelopes and bush fowls. Snail is a high quality meat that is rich in protein, low in fat, a good source of iron and contains almost all the amino acids needed by human (Omole, 2003; Fagburo, 2006; Babalola and Akinsoyinu, 2009; Akinnusi, 2014).

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Snail meat is particularly rich in protein (Ajayi *et al.*, 1978). Imevbore and Ademosun (1988) 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, phosphorus and iron with values of 185.70mg/100g, 61.24mg/100g and 45-50mg/kg, respectively for dry samples (Ademolu *et al.*, 2004) as well as in such amino acids as lysine, leucine, isoleucine and phenylalanine (Imevbore, 1990; Stievenart, 1992; Ademolu *et al.*, 2004). The snail meat is also believed to contain aphrodisiac properties (Addae-Kagyah, 1996). It serves as a ready source of meat to the rural communities where majority cannot afford the high cost of meat (Fagbuaro *et al.*, 2005). The importance of protein in the diet of man cannot be over-emphasized. Protein is required for normal growth and repair of body tissue. 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 factor(s). Soyabean for instance is a vegetable protein source that contains trypsin inhibitor and is deficient in methionine (Jurgens, 2002). Animal protein is of high biological value and possesses all the essential amino acids in desirable quantities.

In West Africa, people gather snails, eat them and sell the remaining as a way of making money. Snail meat has, traditionally, been a major ingredient in the diet of people living in the high forest belts of West Africa. The conventional feeds of snails are bread fruit, water leaf, pawpaw leaf, cabbage, carrot tops, ripe fruits (pawpaw, mango, plantain, banana, pineapple etc) (Amusan and Omidiji,

1999), but these feeds are usually scarce and seasonal especially in the urban areas. Earlier reports (Cobbinah 1994; Baba and Adeleke, 2006) have vividly expressed the advantage of snail farming. Like all wild species, snails are better adapted to their natural environment than to farming, so if local climatic conditions suit snails, they are best farmed outside. The need for increased animal protein consumption of the rural and urban Nigeria populace in the face of rising inflation has resulted in an increase in the cost of conventional animal protein in comparison to plant sources because even the prices of fish have soared above the reach of an average Nigerian hence the rearing of snails is a source of income to the peasant farmer in rural areas (Agbogidi *et al.*, 2008). Snails have been shown to be rich in protein (88.37% dry weight basis) hence can compare favorably with crude protein contents in beef (92.75%), broiler meat (92.215), goat meat (86.63%), mutton (86.34%) and pork (82.42%) (Imevbore and Ademosun, 1988).

Nigeria is Africa's largest oil producer yet an appreciable number of her people are malnourished. A good percentage of the people still live beneath the poverty line, cannot afford the costs of meat, egg, milk which are relatively higher than the cost of carbohydrate products such as cassava, maize and yam. Macro and micro livestock are sources of dietary animal protein. The cost of production of larger livestock is high and is already getting beyond the reach of an average Nigerian farmer. Whereas, the cost of production of micro livestock such as rabbits, cane rats (grass cutters), snails, quails, which are good sources of animal protein, is lower. This study was therefore conducted to assess the proximate composition and mineral analysis of two common snail species (*Archachatina marginata* and *Achatina achatina*) in Ogun

State, Nigeria.

Materials and methods

The study was undertaken at Department of Agricultural Education of the Federal College of Education, Abeokuta, Ogun State. The species of snails used in this study are *Achatina achatina* and *Archachatina marginata*. The snails were obtained from local markets in Odeda Local Government Area of Ogun State. The snail shell was removed, washed and subjected to dryness. The dried snail was later crushed and ground to powder for analysis.

Chemical analysis

The sample analysis was carried out on dry matter basis. The food sample (snails) were analyzed for Moisture content, Ether extract, Crude fibre, Crude protein, Ash content and Nitrogen Free Extract. The mineral analysis was carried out by wet oxidation treatment.

Experimental procedure

Moisture content

Moisture was determined by loss in weight of sample dried at 105°C to a constant weight in an oven. Moisture content percentage $\frac{w_1 - w_2}{w_1} \times 100$

Ether extract

The percent ether extract was calculated as $\% \text{ ether extract (EE)} = \frac{x - y}{x} \times 100$

Where the weight of sample before extraction = Xg

Weight of sample after extraction = Yg

Weight of oil (X-Y)g

Crude Fibre

The percentage crude fibre was calculated as $\% \text{ CF} = \frac{(W_1 - W_2)}{W_1} \times 100$

W1 = weight of dish + sample

W2 = Weight of dish + ash

CF = Crude Fibre

Crude Protein

% Crude protein =

$$0.0004 \times \text{Titre value (V)} \times \frac{100}{s} \times \frac{100}{w} \times 6.25$$

Ash:

The percent total ash was calculated as %

$$\text{Total ash} = \frac{W_1 - W_2}{W_1} \times 100$$

W₂ = Weight of dish + ash

W₁ = Weight of dish + sample

Nitrogen free extract:

$$\% \text{NFE} = 100 - (\% \text{CP} - \% \text{EE} + \% \text{CF} + \% \text{T. Ash})$$

Results and discussion

Proximate composition of *Archachatina marginata* and *Achatina achatina*

The proximate analysis of the snail samples as shown in Table 1 reviewed that protein content was the highest as compared to all the other components that were analyzed and this confirms report on the nutritional protein value of snail meat.

Table 1: Proximate composition of *Archachatina marginata* and *Achatina achatina*

Proximate composition	<i>Archachatina marginata</i>	<i>Achatina achatina</i>
Moisture	74.06	86.11
Dry matter content	25.94	13.98
Ether extract	1.53	0.88
Ash content	1.43	0.79
Crude fibre	0.16	0.18
Crude protein	22.75	11.92
Nitrogen free extract	0.09	0.17

The results above are in g/100g

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The results for the proximate analysis showed that the snail meats (*Archachatina marginata*) and (*Achatina achatina*) have moisture content of 74.06g/100g and 86.11g/100g respectively. The moisture content is higher in *Achatina achatina*. This is due to the water which it is composed of. The blue water in snail is very rich in iron and copper. This can be useful to the human body. Akinnusi *et al.* (2009) noted that the

bluish liquid can be used to treat some diseases like high blood pressure and it is also good for infant development. Snails eat from varied food sources including the soil, and this may account for the ash value obtained in this work.

Mineral analysis of *Archachatina marginata* and *Achatina achatina*

Table 2 shows the mineral analysis of snail samples used for the study.

Table 2: Mineral Analysis of *Archachatina marginata* and *Achatina achatina*

Proximate composition	<i>Archachatina marginata</i>	<i>Achatina achatina</i>
Phosphorus (P)	1.216	1.343
Magnesium (Mg)	0.426	0.438
Iron (Fe)	0.084	0.093
Calcium (Ca)	2.011	2.046
Potassium (K)	1.934	1.967
Chlorine (Cl)	0.795	1.000

The results above are in mg/g

Result obtained from the mineral analysis showed that snail meat has high calcium content as compared to potassium, phosphorus, iron and magnesium. These results compare well to works by Imevbore and Ademosun (1998) and Thompson and Cheney (2008). Result reveals that calcium is higher in *Achatina achatina* (2.046mg/g) than *Archachatina marginata* (2.011mg/g). The level of phosphorus in *Archachatina marginata* was 1.216mg/g and 1.343mg/g in *Achatina achatina*. About 80% of the body's phosphorus is found in the skeletal tissues. It serves as a co-factor for numerous enzymes and activates several of the B complex vitamins. This may account for the use of snail meat to provide anti-rheumatic effect. In addition, snail is a source of calcium orthophosphate, a chemical substrate employed in curing kidney diseases. Mineral analysis of potassium reveals that *Achatina achatina* contains 1.967mg/g and 1.934mg/g in *Archachatina marginata*. This may explain

the use of snail meat in the suppression of hypertension among rural dwellers/people.

Conclusion

This work has shown that snail meat, while providing aroma, flavor and enhancing the taste of foods, also serves as a good source of some essential nutrients which are naturally present in snails. The benefit that can be derived by man and animal from *Archachatina marginata* and *Achatina achatina* cannot be overlooked. Their nutritive value compared favourably with other sources of conventional protein and minerals. It is expected that with more information being supplied to the consumer and as more data become available on other topics on Giant African Land Snail, greater interest may be exploited to it. There is no doubt that if land snail is consumed in adequate quantities, it would help to alleviate deficiency of protein. Also, home breeding of snail could contribute significantly to its supply all year round.

Recommendation

From the result obtained on the mineral and proximate content of snail meat, it could be said that snails are an excellent source of minerals and thus recommended for growing babies, teenagers, pregnant and lactating women. It is also recommended for use by people suffering from diabetes and hypertension and generally for people who would want to maintain good health. In addition, snail meat can be used to develop complementary foods for children under five years to prevent rickets, iron deficiency, anemia and protein energy malnutrition. The consumption of snail meat helps prevent post-partum haemorrhage, night blindness, osteoporosis, hypophosphatemia, and can increase high density lipoprotein. Result obtained in this study gives credence to most of the nutritional and health claims made by traditional people.

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