International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 28 No. 2 September 2021, pp.365-370

Comparison Of Proximate Composition And Mineral Elements Of Archachatina Marginata And Achatina Achatina Meat Fed Natural Feed And Supplemented Diets

Mukaila Adekunle Mumeen[1], Ejidike Bernadette Nwandu[2]

[1]No 5, Apatapiti road, futa Southgate, Akure, Ondo State
Ecotourism and Wildlife Management DEPARTMENT
Federal University of Technology, Akure (FUTA)
Akure, Ondo State, Nigeria

[2]Staff quarters, Federal university of Technology Akure, Ondo State, Nigeria
Ecotourism and Wildlife Management Department
Federal University of Technology, Akure (FUTA)
Akure, Ondo State, Nigeria

Abstract – Two different breeds of snail, Archachatina Marginata (AM), Achatina Achatina (AA), were analyzed for proximate composition and mineral profile of the snail flesh. Proximate analysis of the snail flesh revealed that moisture was highest in Archachatina achatina (84.44%) and least in Archachatina marginata (73.14%). The result revealed that snail meat (Archachatina marginata and Achatina achatina) were found to contain; 12.85% and 15.63% of Protein, 7.41% and 4.08% of Ash content, 2.57% and 2.20% of fat content, 73.14% and 84.4% of Moisture content, 0.25% and 0.14% of Crude fibre content respectively. The result of the mineral content of the snail (Archachatina marginata and Achatina achatina) was found to be 316.67mg/100g of calcium, 24.00mg/100g and 12mg/100g of magnesium, 166mg/100g and 176.33mg/100g of phosphorus, 0.6167mg/100g and 0.5767mg/100g of Copper, 0.35mg/100g and 0.3067mg/100g of iron and 1.24mg/100g and 1.19mg/100g of Zinc respectively. The results of this study revealed that, the meat of Achatina achatina has the highest source of protein and moisture content but low in crude fibre and fat contents.

Keywords – Snail meats, Minerals, Feed, Proximate, diets, Archachatina marginata, Achatina achatina.

I. INTRODUCTION

The African giant land snail (*Archachatina marginata*) is the largest known snail in Africa (Olawoyin and Ogogo, 2006). Snails have high rate of productivity or fecundity. Though they are hermaphrodites, they practice sexual reproduction (Akinnusi, 2004). Snails are selective in their mating partners and sometimes uninterested in mating with other snails of the same species originating from a considerable distance away (Omole and Kehinde, 2005). The natural habitat of snails are mostly found in the forest, farms and gardens where they have unlimited vegetation to feed on. According to Raut and Barker (2002), the most dominant types of vegetation in Africa are the tropical forest and the savannah where a wide variety of the African terrestrial Gastropods inhabit. Most land snails, especially, the African giant land snails that are eaten and exported are usually picked from their natural habitat.

Snail meat is tender and tastes good. It is highly nutritious and when eaten serve as a special delicacy in the diet. Several studies have been conducted on snails in the last three decades. Snail meat is particularly rich in protein, iron, calcium and phosphorous

(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 phenylalaine (Imevbore, 1990; Stievenart, 1992; Ademolu *et al.,* 2004). The snail meat is also believed to contain aphrodisiac properties (Addae-Kagyah, 1996). 2006).The importance of protein in the diet of man cannot be overemphasized. 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. 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).

Many agricultural strategies have been adopted in Nigeria, yet daily per capital animal protein intake (estimated at less than 10g) remains a far cry from the Food and Agricultural Organization (FAO) recommended minimum requirement of 35g (Usman et al, 2003). In order to bridge this gap, it has been suggested that there is the need to explore other sources of animal protein in addition to the conventional sources such as ruminants and poultry (Olayide and Heady, 1982). One of the important alternative sources of animal protein which has received relatively scanty attention in Nigeria is the snail. For instance, snail breeding started as far back as the beginning of the 20th century (Ayodele and Asimalowo, 1991).

Protein malnutrition is a major challenge to most developing countries especially in Africa. This has informed the need for man to explore the use of other sources in the wild in order to meet his body requirements (Ebabhamiegbbho *et al*., 2013) According to Azeez (2009), there is a strong market for snail in hotels and restaurants, which need to be provided about 5,000 snails every week. There is potential for export to the international market and Nigeria can turn into one of the biggest snail exporters.

II. MATERIALS AND METHODS

This study was carried out at the Wildlife Domestication Unit of the Department of Ecotourism and Wildlife Management, Faculty of Agriculture and Agricultural Technology, Federal University of Technology, Akure, Ondo State. This study area is located on elevation 369m – 383m above sea level (Olaniyi et al., 2015). The snails were obtained from pelawi farm in Ibadan, Oyo State, Nigeria. The snails were fed with Natural feed, Natural feed + supplemented Diets and Supplemented diets only. The snail shell was removed, washed and subjected to dryness, meat was extracted and the sample was filtered when the mineral Elements were determined.

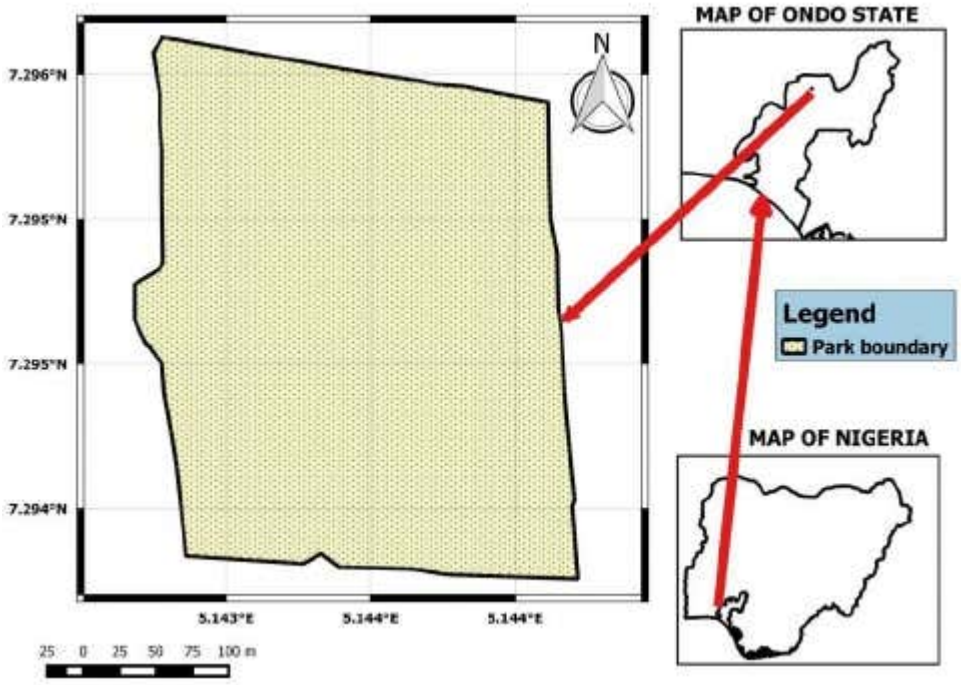

Figure 1: T.A Afolayan Wildlife Park in Ondo State, Nigeria

Chemical Analysis

Protein, crude fibre, fat, Moisture, and ash contents of the flesh were determined by the method of the Association of Official Analytical Chemists (AOAC, 2005).

The Calcium, Magnesium, Phosphorus, Copper, Iron and Zinc were determined by means of Atomic Absorption Spectrophotometry (AAS) Buck Scientific 210 VGP.

Statistical analysis

All data obtained were subjected to t-test analysis using Statistical package for social scientist (SPSS).

III. Results

Table 1: Proximate analysis

Content	*Achatina achatina*	*Archachatina marginata*	S.E.M
Protein	15.63% [a]	12.85% [a]	1.51
Ash	4.08% [a]	7.41% [a]	1.67
Fat	2.20% [a]	2.57% [a]	0.21
Moisture	84.44% [a]	73.14% [b]	2.72
Crude fibre	0.14% [a]	0.25% [a]	0.06

Rows with same superscript are not significantly different

S.E.M: Standard Error of Mean

The proximate analysis of the snail samples as shown in Table 1 result revealed that snail meat (Archachatina marginata and Achatina achatina) were found to contain; 12.85% and 15.63% of Protein, 7.41% and 4.08% of Ash content, 2.57% and 2.20% of fat content, 73.14% and 84.4% of Moisture content, 0.25% and 0.14% of Crude fibre content respectively. The highest protein content was found in *Achatina achatina* snail.

Table 2: Mineral content

Elements	*Achatina achatina*	*Archachatina marginata*	S.E.M
Calcium	316.67[a]	316.67[a]	42.16
Magnesium	12.00 [a]	24.00 [a]	4.10
Phosphorus	176.33 [a]	166.00 [a]	3.88
Copper	0.57 [a]	0.61 [a]	0.04
Iron	0.30 [a]	0.35 [a]	0.02
Zinc	1.19 [a]	1.24 [a]	0.04

Rows with same superscript are not significantly different

S.E.M: Standard Error of Mean

The result of the mineral content in Table 2 shows that *Archachatina marginata* and *Achatina achatina* were found to be 316.67mg/100g of calcium, 24.00mg/100g and 12mg/100g of magnesium, 166mg/100g and 176.33mg/100g of phosphorus, 0.6167mg/100g and 0.5767mg/100g of Copper, 0.35mg/100g and 0.3067mg/100g of iron and 1.24mg/100g and 1.19mg/100g of Zinc respectively.

IV. DISCUSSION

The results for the proximate analysis Table 1 showed that snail meats (*Achatina achatina* and *Archachatina marginata*) have a moisture content of 84.44% and 73.14% respectively. The moisture content is higher in *Achatina achatina*. This is in agreement with the findings of Akinnusi *et al.,* 2018 which reported that the moisture content is higher in *Achatina achatina* 86.11g/100g than *Archachatina marginata* 74.06g/100g which is due to the water which it is composed of. This is also in conformity with the findings of Raimi (2019) who reported that the moisture content of *Archachatina marginata* was low in snail fed with rumen content inclusion (65.03%-69.74%). The protein content is higher in *Achatina achatina*, 15.63% than *Archachatina marginata* 12.83%, this is in contrary with the findings of Babalola and Akinsoyinu, 2009, which reported that *Archachatina marginata* has a higher protein content of 19.53g/100g than *Achatina achatina* with a protein content of 17.20g/100g. The crude protein value compared well with other livestock meat like mutton, duck and chicken which have crude protein contents of 16.9, 18.6 and 20.5% respectively (FAO, 1969). These values were also found to be comparable with values obtained for conventional livestock (FAO, 2001). The result also conforms well with the result of (Awesu, 1980; Odukoya, 1998 and Omole, 2003) that the foot of *Archachatina marginata* contained between 17-18% crude proteins.

Result obtained from the mineral analysis in Table 2, showed that both snail meat (*Archachatina marginata* and *Achatina achatina* has high calcium content of 316.67 as compared to magnesium, phosphorus, copper, Iron, and zinc. This is in tandem with the report of Akinnusi et al., 2018 which reported that snail meat has high calcium content as compared to potassium, phosphorus, iron and magnesium. The result disagrees with the findings of Adeyeye (1996), Ayodele and Asimalowo (1999) that snails' body contains a high concentration of iron.

V. CONCLUSION

The study was designed to compare the proximate composition and Mineral elements of *Archachatina marginata* and *Achatina achatina* meat fed on Natural feed and supplemented diet. Their nutritive value compared favorably with other sources of conventional protein and minerals. The result of this study showed that *Archachatina marginata* and *Achatina achatina* meat is a good source of protein.

On the basis of the findings from this study, these conclusions are made;

i. *Archachatina marginata* and *Achatina achatina* is a good source of Calcium when compared with other mineral Elements

ii. *Archachatina marginata* and *Achatina achatina* is a very good source of protein as compared to conventional protein source.

iii. The result of the study therefore showed that *Achatina achatina* meat has the highest Protein and Mineral content.

RECOMMENDATIONS

From the results, these are recommended.

i. Snail meat should be added to food as a source of protein and Mineral

ii. Snail domestication should be encouraged to further enhance production and consumption.

ACKNOWLEDGMENT

My sincere gratitude goes to the Almighty God for the great opportunity bestowed unto me for seeing me through my project write up.

I wish to express my love and sincere appreciation to my families and friends for their support, love, care and prayers in making my dream a reality.

Also, I am highly indebted to my supervisor in persons of Prof. B. N. Ejidike for her immeasurable contribution towards the success of this report. I also want to thank the entire management of domestication unit of Ecotourism and Wildlife Management for giving me the platform and necessary equipment needed to carry out this project work

REFERENCES

[1] Addae-Kagyah, K. A. 1996 Guidelines for Snail Farming in Ghana. Mamprobi:Advent Press

[2] Ademolu, K. O., Idowu A. B., Mafiana, C. F. and Osinowo, O. A. 2004 Performance, proximate and mineral analyses of African Giant Land Snail (Archachatina marginata) fed different nitrogen sources. African Journal of Biotechnology 3(8):412-417

[3] Adeyeye ET (1996). Waste yield frozen meals and mineral three different types of land snails found in Nigeria. Int. J. food Sci. Nutr. 47:111-116.

[4] Afolayan T.A. and Agbelusi E.A. (1987): Afeasibility report on FUTA Wildlife Park and its botanical garden, a paper presented to FUTA

[5] Agbogidi, O.M. Okonta, B.C. and Ezeani, E.L. (2008). Effects of two edible fruits on the growth performance of African giant land snail. (Archachitina marginata Swainson). Journal of Agricultural and Biological Sciences 3(3): 26- 29.

[6] Ajayi SS, Tewe OO, Moriaty C, Awesu MO (1978) Observationon the biological and nutritive value of the African giant snail,Archachatina marginata. East Africa Wildlife J 16:85–95

[7] Akinnusi O (2004). Introduction to snails and snail farming. Triolas Exquisite Venture. Abeokuta. Nigeria.

[8] Akinnusi, F. A. O., Adeoye, A. S. and Adeleke, D. F. (2018). Chemical composition of snail meat species (Archachatina marginata and Achatina achatina) Nigerian Journal of Animal Production 45(2): 71 - 76

[9] AOAC, 2005. Official methods of analysis of the Association of Official Analytical Chemists. 17th Edn., AOAC, Gathersburg, MD., USA., pp: 18.

[10] Awesu, M.O., 1980. A biology and management of the African giant land snail (A. *marginata*). M.Phil. Thesis, University of Ibadan, Nigeria.

[11] Ayodele IA, Asimalowo AA (1999). Essentials of snail farming.Agape Prints, U.I, Ibadan, p. 51.

[12] Ayodele, I.A. & Asimalowo A.A. (1991) Essentials of snail farming, Ibadan: Lovemost Publications. 33-37.

[13] Azeez, A.I. (2009). Making money from snail farming. The Nation, Wednesday July, 8, 2009 pp. 37.

[14] Babalola O.O. and Akinsoyinu A.O, 2009. Proximate Composition and Mineral Profile of Snail Meat from Different Breeds of Land Snail in Nigeria. *Pakistan Journal of Nutrition, 8: 1842-1844.*

[15] Ebabhamiegbebho, P. A., Ewere, J. O., Evivie, S. E. and Igene, J. O. 2013. Quality Assessment of Processed Edible Worms Sold in Delta State, Nigeria. Biol. and Environ. Sci. J for the Trop. 10(3): 139-144.

[16] Fagbuaro, O., Oso, J. A., Edward, J. B. and Ogunleye, R. F. 2006 Nutritional status of four species of giant land snails in Nigeria. Journal of Zhejiang University of Science 7(9):686-689

[17] FAO, 1969. Food and Agricultural Organisation Trade Book. Vol. 23, FAO., Rome, Italy.

[18] Food and Agriculture Organization (FAO), 2001.The State of the food and Agriculture.Rome , Italy

[19] Imevbore, E. A. and Ademosun, A. A 1988. The nutritive value of the African giant land snail (A. marginata). J. Anim. Prod. Resource 2(8): 76-78.

[20] Jurgens, M. H. 2002 Animal feeding and Nutrition. 9 Ed. Kendall/Hunt Publishing Co., Iowa, USA. Pp. 144-146.

[21] Odukoya, A.A., 1998. Comparative effect of four different leaves on growth performance of grower snails (A. marginata). M.Sc. Thesis, University of Ibadan, Nigeria.

[22] Olaniyi, O. E., Esan, D. B., Odewumi, O.S., Oladeji, S.O. and Oyeleke, O.O. (2016). Ecotourism Resources Mapping of T.A. Afolayan Wildlife Park in Ondo State, Nigeria.

[23] Olawoyin OO, Ogogo AU (2006). Prediction of optimum stocking density in growing African Giant land snails. Trop. J. Anim. Sci. 9(2):72-84.

[24] Olayide SO, Heady EO (1982). Introduction to Agricultural Production Economics. Ibadan: Ibadan University Press.

[25] Omole AJ, Kehinde AS (2005). Backyard snail farming at a glance. Back to Agricultural Series (1) Ibadan Technovisor Agricultural Publications.

[26] Omole, A.J., 2003. Nutrient requirements for different stages of growth of African Giant Snail (Archachatina marginata) Swainson. Ph.D. Thesis, University of Ibadan.

[27] Raimi C.O, 2019 Nutritional Composition of African giant Land Snails (Archachatina marginata) fed rumen content inclusion. GSJ: Volume 7, Issue 2, Online: ISSN 2320-9186

[28] Stievenart, C. 1992. Use of the ratio of live weight: shell length to evaluate the growth of Giant African Snails. Snail Farming Res., 4:45-47

[29] Usman, J.S., A.S. Kehinde, M.O. Ojo, O. Akinyemi and O. Adebayo (2003). “Some aspects of marketing grasscutter (Thryonomy swinderianus)”. In: Taiwo, A.A., A.M. Raji, J.U.