



Effect of Roasting and Oven Drying Processing Methods on the Nutritional Content of Snail and Cow Meats

¹Habila A. J., ²Nura, B., ³Abdullahi, S., ⁴Peter, A. O., ⁵Hassan S.

^{1,2,4&5}Department of Science Laboratory Technology,

³Directorate of Research and Development,

Nigerian Institute of Leather and Science Technology, Zaria

ABSTRACT

Protein is essential for growth, maintenance, and protection of the human body, with both adequate intake and quality required to ensure provision of indispensable amino acids. Processing protein alters its nutritional composition with effects varying by method and intensity. The proximate, vitamin and mineral content of roasted and oven dried processed snail and cow meat samples was evaluated in this study. The proximate composition analysis revealed that roasted snail meat had significantly ($p < 0.05$) higher values of 7.40 ± 0.05 and 65.00 ± 1.00 for Ash and crude protein contents respectively. The roasting processing method shows more content of ash, crude protein and fat in the snail meat than the oven dried processing method. Minerals content analysis revealed that all the samples contained similar values of minerals and processing methods show less effect on the mineral content in all the samples. Snail meat shows appreciable higher values of 4.630 and 8.994 for vitamins A and E respectively and roasting processing method revealed higher content of both vitamins than the oven dried processing method. Based on the present findings, it is therefore, concluded that snail meat contains appreciably higher number of nutritional contents than the cow meat and roasting processing method revealed more nutrient content than the oven dried processing method.

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INTRODUCTION

There is a growing need for the production and consumption of snails in developing countries to meet the protein and micronutrient requirement to tackle the crisis of children and women malnutrition. Snails provide a very cheap source of high-quality animal protein for human consumption. They are used for human nutrition and are distinguished by low-fat and high mineral content, including calcium, magnesium, zinc, copper, manganese, nickel, cobalt, aluminum, sulfur and iodine, as well as vitamin C, which makes it an almost complete food [1; 2] and an ideal meat for diabetics. The galacton present in its abdominal gland serves as a medicinal substance of high immunological value, which

cures tuberculosis, ulcer, asthma and circulatory disorders [3; 4].

The economic and medicinal benefits from snail are immense these runs from their foot tissue to shells [5]. Snails are cheap to rear at subsistent and commercial levels with high returns on low input. Snail meat in Nigeria is regarded as an occasional meat instead of a frequently consumed nutritious meat like those of livestock, some ethnic groups discourage the eating of some species of snails [6; 7; 8; 9]. Hence, this research was aimed at comparing effect of roasting and oven drying on the nutritional content snail meat compared to cow meat

Corresponding author: Habila A. J.,

habilaamaya@gmail.com

Department of Science Laboratory Technology, Nigerian Institute of Leather and Science Technology, Zaria.

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METHODOLOGY

Sample collection

The snails were obtained in a moist area within the Nigerian Institute of Leather and Science Technology (NILEST), Samaru, Zaria, while the cow meat was purchased from Samaru market, all within Kaduna state. The snails were sorted to remove dead snails and dirty materials, the shells of the snails were removed using stone and clean knife and the snail and cow meats were placed in a clean container for subsequent processing and analysis.

Sample preparation and processing

Each of the samples were washed in clean water with 5% w/v NaCl and rinsed severally until a clear water was obtained. The snails and cow meats were then preheated in 5% (w/v) NaCl solution for about 20 minutes at a maximum temperature of 60 °C to break up the chemical bonds in the proteins and other macro molecules in the meat thereby softening the meat and releasing water from the meat which might affect drying. The oven drying and roasting processing was carried out using methods described by [10; 11] respectively. The samples were analyzed for their proximate composition using the AOAC [12] methods. Total crude protein was determined by Kjeldahl [13] method using 6.25 as the conversion factor. Energy content was determined by [10]. The mineral contents were determined according to the method described by [14].

Statistical analysis of data

Data obtained from proximate were analyzed by analysis of variance (ANOVA) using statistical package for the social science (SPSS) version 20.0 software. The differences between samples were compared using Duncan multiple range test. P value less than 0.05 ($P < 0.05$) was considered as significant.

RESULTS

Nutritional parameters of the proximate composition of roasted and oven dried snail and cow meat are presented in table 4.1. Roasted cow meat had the highest moisture content ($13.00 \pm 0.25\%$). Roasted snail meat had the highest content of protein ($65.00 \pm 1.00\%$) and ash ($7.40 \pm 0.005\%$) which differ significantly from that of the cow meat. while the oven dried cow meat had the highest content of fat ($15.00 \pm 0.20\%$) and energy content (1812 ± 32.00 KJ/100g), the oven dried snail meat had the highest content of carbohydrate ($22.00 \pm 1.00\%$) only. Most of the parameters differ significantly ($p < 0.05$).

Mineral content, presented in table 4.2 shows that there is no much variation in zinc and calcium content in both roasted and oven dried cow and snail meat except for iron, which is higher in the roasted cow meat (0.402ppm). Vitamin A and vitamin E content of the processed cow and snail meat sample are presented in table 4.3. The roasted snail meat had the highest content of both vitamins A (4.630 IU/L) and vitamin E (8.994 IU/L).

Table 4.1: Proximate Composition of Roasted and Oven Dried Processed Snail and Cow Meat.

Parameters (%)	Roasted		Oven Dried	
	Cow	Snail	Cow	Snail
Moisture	13.00 ± 0.25^a	10.00 ± 0.52^b	9.40 ± 0.47^b	8.90 ± 0.96^b
Ash	5.60 ± 0.005^a	7.40 ± 0.005^b	2.10 ± 0.005^c	4.70 ± 0.005^a
Crude Protein	50.00 ± 0.02^a	65.00 ± 1.00^b	49.00 ± 0.01^a	60.00 ± 0.02^b
Fat	14.00 ± 0.26^a	4.90 ± 0.15^b	15.00 ± 0.20^a	4.20 ± 0.10^b
Carbohydrate	17.00 ± 0.67^{ab}	13.00 ± 2.50^b	15.00 ± 0.50^{ab}	22.00 ± 1.00^a
Energy Content (KJ/100g)	1708 ± 11.00^{ab}	1501 ± 10.00^b	1812 ± 32.00^a	1552 ± 14.002^b

Values are expressed as mean $\pm$ standard deviation of two determinations. Different

superscript across column is significantly ($p < 0.05$) different.

Corresponding author: Habila A. J.,

habilaamaya@gmail.com

Department of Science Laboratory Technology, Nigerian Institute of Leather and Science Technology, Zaria.

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Table 4.2: Mineral Content of Roasted and Oven Dried Processed Snail and Cow meat.

Mineral (ppm)	Roasted Cow	Snail	Oven Dried Cow	Snail
Zinc	0.477	0.482	0.468	0.465
Calcium	0.034	0.035	0.042	0.019
Iron	0.402	0.195	0.013	0.127

Table 4.3: Vitamin Content of Roasted and Oven Dried Processed Snail and Cow meat.

Vitamin (IU/L)	Roasted Cow	Snail	Oven Dried Cow	Snail
Vitamin A	2.161	4.630	0.772	0.926
Vitamin E	4.927	8.994	2.839	2.321

DISCUSSION OF FINDINGS

Protein had the lowest value in oven dried cow meat (49.0%), and roasted cow meat (50.0%), higher in the oven dried snail meat (60.0%), and with the highest value in the roasted snail meat (65.0%). This result shows a high percentage of crude protein in snail meat as reported in literatures [15; 16] for unprocessed *Archachatina maginata* snail. This brings out the fact that snail meat is a high-quality protein rich food which is also higher than those found in meat of other conventional livestock. [17] reported snail meat to contain protein, mainly polyunsaturated fatty acids, magnesium, iron, copper, calcium, phosphorus, zinc, foliates, also with vitamins A, B6, B12 and vitamin K. Snails in addition contains essential fatty acids such as linolenic and linoleic acids for normal tissue development and maintenance, and also contains amino acids lysine and arginine at higher levels than in whole egg.

The moisture content determined was highest in the roasted cow meat (13.0%), followed by the roasted snail meat (10.0%), then the oven dried cow meat (9.0%) and the lowest in the oven dried snail meat (8.0%). These values are far lower than the one obtained from *Archachatina maginata* snail by [18], although their work was on the unprocessed meat samples. The ash content, fat, carbohydrate and energy content are presented in Table 4.1. The result shows that the snail meat has high ash content of (7.4%) for the roasted snail meat and (4.7%) for the oven dried snail meat as compared to that of the roasted cow meat (5.6%) and oven dried cow meat (2.1%).

This report also agrees with that of [18], and [16] which reported snail meat to have high ash content. The result also shows snail meat to have lower fat, carbohydrate and energy content as compared to that of the cow meat.

The mineral and vitamin content of the processed meat sample are as shown in Table 4.2 and Table 4.3 respectively. According to [16], snail meat is rich in minerals such as Ca, Fe, P, Mg, Cu. The results in Table 4.2, shows similar Zn and Ca content in both roasted and oven dried cow and snail meat which are within the range of 0.465-0.482 ppm and 0.019-0.04 ppm respectively. The Fe content is however higher in the cow meat roasted sample (0.40 ppm) than the snail meat roasted sample (0.19 ppm). Vitamin A and E values are lower in the cow meat roasted sample (2.16 and 4.92 IU/L respectively) and higher in the snail meat roasted sample (4.63 and 899 IU/L respectively). Therefore, snail meat is a very nutritious food that is highly recommended for consumption.

CONCLUSION

The present study revealed that snail meat had more nutrients content such as protein, minerals and vitamins compared to those obtained from cow meat. The roasted snail meat had higher content of protein and ash and less content of moisture, which can make it possible to be stored for longer period of time than the cow meat. Again, oven dried processing method significantly reduced the content of most of the nutrients of two meat samples. It is therefore, concluded that roasting processing method is encouraged for

Corresponding author: Habila A. J.,

habilaamaya@gmail.com

Department of Science Laboratory Technology, Nigerian Institute of Leather and Science Technology, Zaria.

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meat processing as it retained much nutrients than the oven dried processing method.

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Corresponding author: Habila A. J.,

✉ habilaamaya@gmail.com

Department of Science Laboratory Technology, Nigerian Institute of Leather and Science Technology, Zaria.

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