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A nutritional and organoleptic assessment of the meat of the giant African land snail (*Archachatina maginata* swaison) compared to the meat of other livestock

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Abstract

The nutritional quality and organoleptic characteristics of the meat of the Giant African Land Snail (*Archachatina marginata*) was compared to the meat of the conventional livestock species (beef, rabbit and chicken). Each of the meat samples was processed using three different cooking methods (i.e. boiling, frying and barbecuing) and their organoleptic and sensory characteristics were evaluated (appearance and colour, juiciness, taste and general acceptability) using a 7-point descriptive Hedonic Scale.

Crude protein value was lowest in the chicken meat (18.3%), slightly high in rabbit meat (20.0%) and beef (19.6%) and was highest in snail meat (20.5%), showing that snail meat is a high quality protein food with the crude protein content higher than those of conventional livestock. But the meat of rabbit, chicken and beef were highly accepted for their appearance and colour, juiciness and taste when boiled, fried and barbecued (organoleptic and sensory characteristics); whereas snail meat had a significantly lower acceptance ($p<0.05$) among the respondents. Therefore, the consumption of snail meat in Minna, Niger State of Nigeria is governed more by cultural bias than by social status or nutritional quality; hence, a massive awareness campaign on the nutritional and health benefits of snail meat is needed.

Key words: Cooking methods, conventional livestock, cultural bias, hedonic scale

Introduction

Heliculture is the science and occupation of raising snails; and there is a growing interest in the rearing of snail for meat and for sale in Africa and in Nigeria in particular (Omole 2001). The commonest breed of African snails is the *Archachatina marginata* (Giant African Land Snail), which has various names in the local dialects (*Igbin Apinu* in Yoruba; *Dodon kodi* in Hausa; *Ekpa* in Nupe and *Eju* or *Ejuna* in Igbo). It grows exceptionally large and has been known to reach 20cm in shell length; the adult being consistently bigger than the average sized *Archachatina fulica* specimens. The meat is highly nutritious containing 37.5% protein (on DM basis); has high iron

content (45 to 59 mg/kg) and low sodium (2.32g/100g) and fat (0.05-0.08%) contents (Sogbesan and Ugwumba 2008). The meat is low in cholesterol and is a source of vital minerals required for normal tissue development and maintenance; and it is an ideal meat for diabetics and those with vascular diseases such as heart attack, cardiac arrest, hypertension and stroke (Funmilayo 2008). However, snail meat (called "Congo Meat") is still a delicacy in most homes in Nigeria; it is regarded as a form of bush meat or game meat to be eaten occasionally instead of being a nutritious meat to be relished on a daily basis just like the meat of other conventional livestock (Malik and Dikko 2009). Some ethnic groups even have superstitious beliefs that discourage the eating of snail meat or the eating of certain species of snail to the detriment of others. Uboh et al (2010) has observed that while *Archachatina marginata* is generally accepted for consumption, there is a strong cultural discrimination in the consumption of *Achatina achatina* by some tribes in Southern Nigeria in spite of the fact that both species showed no significant ($p>0.05$) differences in their proximate, mineral and toxicant compositions (i.e. phytate, oxalate and hydrocyanic acid content). Hence, this research study was aimed at comparing the nutritional and organoleptic characteristics of the meat of the Giant African Land Snail to the meat of other conventional livestock species.

Materials and Methods

Study Location

This Research Study was carried out at the Animal Production Laboratory of the Federal University of Technology, Minna. Minna is the State Capital of Niger State and is located in the South Guinea Savanna Vegetation Zone, between Latitude $9^0 37'$ North and Longitude $6^0 33'$ East. Its mean annual rainfall and temperature range from 1200 to 1300mm and 38 to 42^0C respectively (2008 Students' Handbook, Federal University of Technology, Minna).

Meat Samples Collection and Preparation

The meat samples of rabbit and snail were purchased from Kaduna Central Market, Kaduna State, while beef and chicken (broiler) were purchased from Minna Central Market at the Beef and Chicken Unit of the Market. They were then taken to the Animal Production Laboratory of the Federal University of Technology, Minna, where they were analyzed for their proximate composition using the methods of AOAC (1990). Each of the various meat samples was washed, and then dressed normally separating the flesh from the bones. The snail was washed with alum after separating it from the shell and rinsed with water. The meat samples were then cut into equal sizes (5g) and processed using different cooking methods such as boiling, frying, and barbecuing/roasting; the same size of spices were added to each meat sample.

Questionnaire Design and Administration

A questionnaire was designed to evaluate the organoleptic and sensory characteristics of the various meat samples in terms of appearance and colour, juiciness, taste, texture and overall general acceptability using a seven-point descriptive Hedonic Scale (7- Like extremely, 6- Like very much, 5- Like moderately, 4- Neither like nor dislike, 3- Dislike moderately, 2- Dislike very much, 1- Dislike extremely). A taste panel of 20 judges, consisting of randomly selected students from various departments, members of the non-academic staff, lecturers and casual workers from outside the University Community, were used for the assessment. The meat samples were coded and served anonymously to the panelists.

Statistical analysis

The data obtained from the sensory evaluation of the various meat samples were statistically analyzed using the Complete Randomized Design (CRD) Model. Where the means were significant, they were separated using the Duncan's Multiple Range Test (at 5% probability level) using the SPSS (Statistical Package for the Social Sciences) Computer Package: Version 11, Windows 2000.

Results and Discussion

Table 1. Proximate composition of the various meat samples

	Meat samples (fresh)			
	Snail	**Beef**	**Rabbit**	**Chicken**
Moisture content	63.1	63.9	71.4	69.4
Dry matter	36.9	36.1	28.6	30.6
As % of DM				
Crude protein	20.5	19.6	20.1	18.3
Ether extract	3.98	5.48	2.21	5.05
Ash	6.49	4.91	4.38	4.99
Nitrogen free extract	5.93	6.11	1.91	2.26
Crude fibre	Negligible	Negligible	Negligible	Negligible

Table 1 shows the proximate composition of the various meat samples. It was observed that crude protein value was lowest in chicken (18.3%), slightly high in rabbit (20.1%) and beef (19.6%) but was highest for snail (20.5%). This result is similar to the crude protein value of 19.5% obtained by Babalola and Akinsoyinu (2009) and 25.7% obtained by Adeola et al (2010) for *Archachatina maginata* snail. Also, the 18.3% crude protein value obtained for chicken meat is close to 20.5% crude protein value reported for chicken meat, 16.9% for mutton and 18.6% for duck meat respectively by FAO (1969). All these point to the fact that snail meat is a high quality food that is rich in protein; and the protein content is higher than those found in the meat of other conventional livestock. According to Ukpong (2009), snail meat contains protein, fat (mainly polyunsaturated fatty acids), iron, calcium, magnesium, phosphorus, copper and zinc; as well as vitamin A, B_6, B_{12}, K and foliates. It also contains the amino acids arginine and lysine at higher levels than in whole egg, plus essential fatty acids such as linoleic and linolenic acids, required for normal tissue development and maintenance.

Moisture content was highest for the rabbit meat (71.4%), followed by the chicken meat (69.4%); and lowest in the snail meat (63.1%). This value (63.1%) is lower than 73.6% obtained for *Archachatina maginata* snail by Babalola and Akinsoyinu (2009). The ether extract and ash content of the various meat samples are shown in Table 1. This result shows that snail meat has low ether extract content and high ash content comparable to 2.44% and 2.56% obtained respectively by Babalola and Akinsoyinu (2009). According to this author, snail meat is rich in minerals containing Ca (126 mg/100g), Fe (2.29 mg/100g), P (22.9 mg/100g), Mg (25.1 mg/100g) and Cu (1.03 mg/kg). This is close to 187 mg/100g obtained for Ca, 17.5 mg/100g for Na and 25.6 mg/100g for K by Adeola et al (2010). Hence, snail meat is a very nutritious protein food that is highly suitable for human consumption and is free from heavy metals such as lead (Pb) and mercury (Hg).

The mean sensory values of the various meat samples when boiled, fried and barbecued or roasted are presented in Tables 2, 3 and 4. The meat samples of rabbit, chicken and beef were highly accepted in terms of their appearance and colour, juiciness and taste when boiled, fried and barbecued whereas, snail meat had a significantly ($p<0.05$) lower acceptance among the respondents compared to beef, rabbit and chicken meat. In terms of texture, however, there was no significant ($p>0.05$) difference among all the various meat samples when cooked and fried. But when roasted or barbecued, snail meat was not significantly ($p>0.05$) different from beef in terms of texture, but was significantly ($p<0.05$) harder when compared to chicken and rabbit meat, with chicken meat being significantly ($p<0.05$) the softest.

Table 2. Mean sensory values of the various meat samples when boiled

	Meat samples					
	Rabbit	**Beef**	**Chicken**	**Snail**	**SEM**	**P**
Appearance/colour	5.75[a]	5.35[a]	5.95[a]	4.55[b]	0.13	0.001
Juiciness	5.19[a]	5.25[a]	5.35[a]	4.09[b]	0.16	0.015
Taste	5.79[a]	5.55[a]	5.99[a]	3.95[b]	0.14	0.001
Texture	4.29	3.75	3.19	4.15	0.17	0.252
General acceptability	4.45[a]	5.39[a]	5.85[a]	4.35[b]	0.13	0.001

[abc] *Means within rows without common superscript differ at p<0.05*

Table 3. Mean sensory values of the various meat samples when fried

	Meat samples					
	Rabbit	**Beef**	**Chicken**	**Snail**	**SEM**	**P**
Appearance/colour	5.89[a]	6.15[a]	6.15[a]	4.35[b]	0.15	0.001
Juiciness	5.39[a]	5.69[a]	5.99[a]	3.69[b]	0.17	0.001
Taste	5.79[a]	6.05[a]	6.11[a]	4.65[b]	0.14	0.001
Texture	4.29	4.19	3.95	4.75	0.16	0.36
General acceptability	6.05[a]	5.95[a]	6.19[a]	4.65[b]	0.13	0.001

[abc] *Means within rows without common superscript differ at p<0.05*

Table 4. Mean sensory values of the various meat samples when barbecued or roasted

	Meat samples					
	Rabbit	**Beef**	**Chicken**	**Snail**	**SEM**	**P**
Appearance/colour	5.59[a]	5.69[a]	5.79[a]	3.89[b]	0.16	0.001
Juiciness	5.79[a]	4.79[a]	5.49[a]	3.25[b]	0.18	0.001
Taste	5.55[a]	5.65[a]	6.05[a]	3.35[b]	0.17	0.001

Texture	4.29[b]	4.69[a]	3.29[c]	4.99[a]	0.18	0.003
General acceptability	7.69[a]	5.59[a]	5.95[a]	3.45[b]	0.17	0.001

[abc] *Means within rows without common superscript differ at p<0.05*

Table 5. The combined mean sensory values obtained for the various processing methods

	Meat samples					
	Rabbit	**Beef**	**Chicken**	**Snail**	**SEM**	**P**
Appearance/colour	5.75[a]	5.73[a]	5.97[a]	4.22[b]	8.48	0.001
Juiciness	5.13[a]	5.25[a]	5.62[a]	3.98[b]	9.93	0.001
Taste	5.72[a]	5.75[a]	6.05[a]	3.98[b]	8.17	0.001
Texture	4.07[b]	4.22[ab]	3.48[c]	4.63[a]	9.84	0.001
General acceptability	5.73[a]	5.65[a]	5.99[a]	4.13[b]	8.54	0.001

[abc] *Means within rows without common superscript differ at p<0.05*

The combined mean sensory values obtained for the three processing methods for appearance and colour, juiciness, taste and general acceptability showed that the acceptance of snail by all the panelists was significantly ($p<0.05$) lower when compared to beef, rabbit and chicken meat (Table 5). This result differs from the findings of Ukpong (2009) when he fed snail and its pie as well as beef and its pie to school-age children and young mothers. He found that the snail pie was preferred ($p<0.05$) over meat pie in terms of appearance, texture, taste and flavour. Hence, he recommended snail pie as a cheap source of protein and iron for school-age children and young mothers. But the result agrees with the findings of Uboh et al (2010) that the consumption of snail meat by some rural communities in Southern Nigeria is governed more by culture than by social status or nutritional quality.

Conclusion

- From this study, it is clear that the crude protein content of fresh snail meat is higher than those of rabbit, chicken and beef. Also, snail meat has higher ash content than the meat of other conventional livestock species.
- Nigerians in Minna, and by extension the North-Central geopolitical zone of the country, are biased towards the eating of snail meat in spite of its numerous nutritional benefits and its high protein quality. Hence, the consumption of snail meat in this region is governed more by cultural bias than by social status or nutritional quality.
- Government should carry out a massive awareness campaign on the nutritional and health benefits of snail meat. This will motivate Nigerians towards the consumption of snail meat as it can massively bridge the gap between the animal protein supply and demand in Nigeria.

References

Adeola A J, Adeyemo A I, Ogunjobi J A, Alaye S A and Adelakun K M 2010 Effect of natural and concentrate diets on proximate composition and sensory properties of Giant Land Snail (*Archachatina maginata*) meat. *Journal of Applied Sciences in Environmental Sanitation, Vol. 5 No. 2, pp. 185-189*

AOAC 1990 Association of Official Analytical Chemists. *Official Methods of Analysis,* 13th ed., Washington D.C., USA

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(12): 1842-1844*

FAO 1969 Food and Agricultural Organization Trade Books, Vol. 23, Rome, Italy

Funmilayo S M 2008 Preliminary investigation of the growth performance of Giant Land Snail (*Archachatina marginata*) fed with selected household wastes. *African Journal of Agricultural Research 3(9): 647 – 649*

Malik A A and Dikko A H 2009 Heliculture in Nigeria: The Potentialities, Opportunities and Challenges (A Review). *Proceedings of the 34th Annual Conference of Nigerian Society for Animal Production, University of Uyo Town Campus, pp. 120-1124*

Omole A J 2001 Problems associated with Snail Farming: A paper presented at the monthly Technical Review meeting of Ondo State Agric. Development Project

Sogbesan A O and Ugwumba A A A 2008 Nutritional values of some non-conventional animal protein feedstuffs used as fishmeal supplement in aquaculture practices in Nigeria. *Turkish Journal of Fisheries and Aquatic Sciences, 8: 159-164*

Uboh F E, Ebong P E and Mbi E 2010 Cultural discrimination in the consumption of black snail (*Archachatina marginata*) and white snail (*Achatina achatina*); any scientific justification? *International Research Journal of Microbiology Vol.1 (1), pp.13-17*

Ukpong S U 2009 Snail (*Archachatina marginata*) pie: a nutrient-rich snack for school-age children and young mothers. *International Journal of Food Safety, Nutrition and Public Health, Vol. 2, No. 2, pp. 125-130*

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