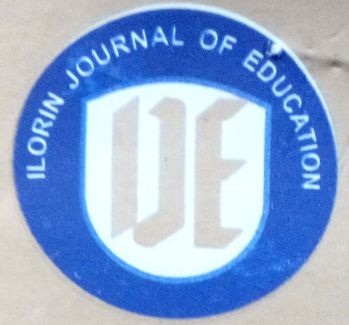




ILORIN JOURNAL OF EDUCATION

ISSN: 0189-6636

VOLUME 33 DECEMBER, 2014

EDITORIAL TEAM

Editor-in-Chief

Professor Alfred A. Adegoke,
Dean, Faculty of Education, University of Ilorin

Managing Editor

Shehu Raheem Adaramaja (Ph.D.),
Faculty of Education, University of Ilorin

Associate Editor

Bode Olumorin (Ph.D.),
Faculty of Education, University of Ilorin

Internal Editorial Board Member

Professor A. A. Sanusi	Department of Health Promotion and Environmental Health Education, University of Ilorin
Oniye A. O. (Ph.D.),	Department of Counsellor Education, University of Ilorin
Oyelekan O. S. (Ph.D.),	Department of Science Education, University of Ilorin
Adewuyi F. O. (Ph.D.),	Department of Arts Education, University of Ilorin
Okunloye R. W. (Ph.D.),	Department of Social Science Education, University of Ilorin
Dominic O. L. (Ph.D.),	Department of Human Kinetics Education, University of Ilorin
Ogunlade O. O. (Ph.D.),	Department of Educational Technology, University of Ilorin

Secretary

Abdulrasaq Qazeem Onaolapo, Faculty of Education, University of Ilorin

Consulting Editors

Professor Ugur Demiray,

Professor N. Balasurubramanian,
Charles Isitoa Juwah,

Faculty of Communication Sciences,
Anadolu University, Eskisehir, Turkey
Bharathiar University, Coimbatore, India
The Robert Gordon University, Schoolhill,
Aberdeen

Review Board

Gulsun Kurubacak (Ph.D.),

Ali Fawaz Sahreef (Ph.D.),

Ezendu Ariwa,

Satyadhyan R. Chicherur,

College of Open Education, Anadolu
University, Eskisehir, Turkey
Maldives College of Higher Education,
Male Maldives
London Metropolitan University, Business
School, London, UK
Sonal College of Technology, Salem India

SENSORY EVALUATION AND ACCEPTABILITY OF SELECTED COOKING METHODS ON SNAIL MEAT

Adebisi, Taibat Tunrayo, Abdul kadir, Shakirat Odunayo, Adebisi,
Winnifred Oluwaseyi and Opaleke, Deborah Oluyemisi

University of Ilorin, Faculty of Agriculture,
Department of Home Economics and Food Science
P.M.B 1515, Ilorin, Kwara State

University of Ibadan, Faculty of Agriculture, Department of Agricultural Extension,
Ibadan.

¹adebisi.tt@unilorin.edu.ng ²sbdaddysqueen988@gmail.com, ³winnifred4u@gmail.com
& ⁴dopaleke@yahoo.com

+2348050324198, +2348061516669, +2348073019058, +2348053826321

Abstract

The study investigated sensory evaluation and acceptability of selected cooking methods of snail meat. Snail meat of two varieties (*Archatina archatina* and *Archachatina marginata*) were processed through lime and alum washing prior to frying and roasting as two selected cooking methods. A total of 30 live snails of the two varieties were used for the study. The snail varieties were processed before the meat were analyzed for sensory qualities. A total of 24 panelists were randomly selected, trained and allotted to eight groups. Roasting and frying methods of cooking were used to assess for the colour, taste, aroma, texture and general acceptability of the snail meat. A nine point hedonic scale was used for scoring. Data collected was analyzed using mean, analysis of variance and Duncan multiple Range test. In the sensory quality finding, it was observed that the highest score of taste was obtained in lime treated roasted *Archatina archatina* while the least score was in alum treated roasted *Archatina archatina*. Higher significant ($P < 0.05$) scores were obtained in the colour of alum treated *Archatina archatina*. Lime treated *Archatina archatina* and alum roasted *Archachatina marginata*. Aroma and texture scores were significant ($P < 0.05$) higher than alum treated fried *Archatina archatina*. The most acceptable snail meat were alum treated fried *Archatina archatina*, lime treated roasted *Archatina archatina* and lime treated roasted *Archachatina marginata*. It was concluded that roasting method of cooking snail meat is better because the methods retained their nutritive value. In addition, *Archatina archatina* is recommended ahead of *Archachatina marginata*. Furthermore, either lime or alum washing is recommended for processing snail meat.

Keywords: Evaluation, Sensory, Acceptability, Cooking; Snail Meat

Introduction

The food crisis that is facing the whole Africa populace is the deficiency of animal source protein in food. In Nigeria today, the rapid population growth has made the demand for animal protein very severe. Lulz & Przytulski (2008) observed that the excess demand for animal protein faced the price up because the supply cannot be increased to meet this ever increasing demand. The problem of protein deficiency in the diet of people

in many developing countries has caused a lot of malnutrition diseases such as kwashiorkor among others.

Children of the poor masses are mostly affected because of their high protein, phosphorus, calcium and vitamin requirements, since their parents are mostly peasant farmers who cannot afford the exorbitant price of proteinous foods like eggs, fish, milk, mutton etc. In view of this, snail rearing and production can fill the gap because it is cheap to produce and own a snailery (heliculture) which can serve as a cheap source of animal protein required for healthy living. It could also serve as a source of extra income for farmers. According to Adeosun & Imerbore (2001) and Akinusi (2008) they explained that owning a snailery requires less capital and attention when compared with poultry or rabbit keeping.

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). Adeola, Adeyemo, Ogunjobi, Alaye & Adedokun (2010) explained that 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 *Ejuma* 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 & Ugwumba 2008). AOAC (2000) had a comprehensive classification of edible land snail into the following groups; Phylum (Mollusca), Class (Gastropoda), Subclass (Stylommatophora), Order (Helicidae Archatinoidea) Family (Helix, cepea, otala, theba, Adia) Genus (Tina) Species (Pomatia, Achachatina, Hortensis, Lacteal, Pisama, Archatina Marginata).

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 & 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.

Agricultural Research service Dietary Guideline Committee (2000) observed that while *Archachatina marginata* is generally accepted for consumption, there is a strong cultural discrimination in the consumption of *Archatina archatina* 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). According to Olusanya, Bala, Eyisi & Olojola (2000), they explained that foods are cooked in different methods such as boiling, stewing,

roasting, frying and grilling. The commonly used basic cooking methods are divided into two general groups they are dry and moist cooking methods. This is because of the way they are cooked and the type of heat that is require for the cooking.

Furthermore, dry heat cooking method does not use water to cook the food. The food is left dry and heat is applied to cook the food. Such methods of cooking are baking, steaming, grilling and roasting. When heat is applied to the food, the food cooks in its own juice or the water added to the food during its preparation evaporates during the heating process and this cooks the food. Heat is applied directly to the food by way of convection thus making the food to get cooked. The action or movement of air around the food, cooks it.

Another method of cooking according to Olusanya, Bala, Eyisi & Olojola (2000), is moist heat cooking method. Liquid is used as a medium of cooking, enough water is added to food and it is then cooked over the fire. The action of the heated makes the food to get cooked. The liquid are added to the food before the heat is applied to it or sometimes heat is applied to the liquid before the food is added into the cooking utensils to be cooked. The moist heat cookery method include; boiling, stewing, frying, barbequing and basting.

For the purpose of this study, roasting as a dry heat method and frying as moist heat method of cooking was selected for cooking of snail meat. Hence, this study was aimed at comparing sensory qualities and acceptability of the snail meat using different cooking methods.

Objective of the Study

The broad objective of the study was to determine the sensory evaluation and acceptability of selected cooking methods of Snail meat.

The specific objectives are to:

1. Identify selected cooking methods for snail meat.
2. Evaluate the sensory qualities and acceptability of snail meat cooked with frying and roasting methods.

Research Questions

Two research question were used to guide the study and these are:

1. What are cooking methods for snail meat?
2. What are the sensory qualities and acceptability of snail meat cooked with frying and roasting methods?

Research Hypothesis

The null hypothesis of the study is:

H₀₁: There is no significant relationship of sensory qualities of treated snail meat on the cooking methods.

Sensory Evaluation and Acceptability of Selected Cooking Methods

Methodology

Materials: Two varieties of land snail (*Archatina archatina* and *Archachatina marginata*) were sourced from Oje market in Ibadan metropolis. Other materials used were frying pans, groundnut oil, Bolium, salt, knife, gas cooker, alum and lime.

Methods: A total of thirty (30) life snails of two varieties (*Archatina archatina* and *Archachatina marginata*) were used in this study. Each variety of the snails were fifteen in number. The snail varieties were processed before they were analyzed for their sensory qualities, a total of 24 panel were randomly selected, trained and allotted to eight groups. Snail meat treated and cooked with two different methods were used with Duncan Multiple Range Test.

Processing Methods: the viscera mass of each of the snails were carefully detached from their shell. Thereafter, the viscera mass samples were processed using the following methods.

Lime washing plus roasting: Six (6) viscera masses from the two varieties of snail through the combination of lime washing and roasting. Each variety consisting of three (3) viscera masses was washed with lime water prior to roasting at 150°C for 1 hour. After roasting, the viscera masses were allowed to cool and tagged lime treated-roasting *Archatina archatina* and *Archachatina marginata* respectively.

Alum washing plus roasting: Another batch of six (6) viscera masses from the two varieties of snail were processed through combination of lime washing and roasting. Each variety consisting of three (3) viscera masses was washed with alum water prior to roasting at 150°C at 1 hour. After roasting, the viscera masses were allowed to cool and tagged alum treated roasted *Archachatina marginata* and *Archatina archatina* respectively.

Lime washing plus frying: Six (6) viscera masses from the two varieties of snail were processed through the combination of lime washing and frying. Each variety consisting of three (3) viscera masses was washed with lime and seasoned prior to frying with vegetable oil for 10 minutes. After frying, the viscera masses were allowed to cool and were tagged lime treated fried *Archatina archatina* and *Archachatina marginata* respectively.

Alum washing plus frying: Another batch of six (6) viscera masses from the two varieties of snail were processed through combination of alum varieties and frying. Each variety consisting of three (3) viscera masses was washed with Alum and seasoned prior to frying with vegetable oil for 10 minutes. After frying, the viscera masses were allowed to cool and were tagged alum treated fried *Archatina archatina* and *Archachatina marginata* respectively.

Results and Discussion

The results were presented as follow:

Table 1: Cooking methods and Sensory properties of treated Snail meat.

Sensory Property	LROAA	ALROAA	LFAA	ALFAA	LROAM	ALROA M	LFAM	ALFAM
Taste	4.8a ±0.04	3.1c ±0.01	4.7a ±0.02	4.3a ±0.04	3.9b ±0.01	2.6c ±0.02	4.5a ±0.097	3.7b ±0.03
Colour	4.2a ±0.07	4.1ab ±0.04	3.8bc ±0.01	4.5a ±0.04	3.9bc ±0.03	4.1ab ±0.04	3.3c ±0.02	3.5c ±0.04
Aroma	4.3b ±0.05	3.3d ±0.02	3.9c ±0.05	4.9a ±0.05	4.1b 0.04	4.0bc ±0.03	4.1bc ±0.06	3.7c ±0.05
Texture	3.0c ±0.01	3.9b ±0.02	3.8b ±0.07	4.3a ±0.03	4.1ab ±0.04	3.1c ±0.03	3.1c ±0.03	3.3c ±0.01
Acceptability	4.3a ±0.03	3.5d ±0.01	4.0bc ±0.01	4.1a ±0.01	4.2a ±0.03	3.8c ±0.02	3.7c ±0.04	3.8c ±0.02

Source: Field Survey (2014).

KEY: Means with different letters along the rows are significantly different ($P < 0.05$)

LROAA= Lime treated roasted *Archatina archatina*

ALROAA= Alum treated roasted *Archatina archatina*

LFAA= Lime treated fried *Archatina archatina*

ALFAA = Alum treated fried *Archatina archatina*

LROAM = Lime treated roasted *Archachatina marginata*

ALROAM = Alum treated roasted *Archachatina marginata*

LFAM = Lime treated fried *Archachatina marginata*

ALFAM= Alum treated fried *Archachatina marginata*

ALROA= Alum treated roasted *Archachatina marginata*

Taste: Lime treated-roasted *Archatina archatina* had the highest taste value of 4.8% but did not significantly differ ($P > 0.05$) from the scores obtained from lime treated fried *Archatina archatina*. (4.7%) And lime treated fried *Archachatina marginata*, (4.5%) significant reductions ($P < 0.5$) were however obtained from the scores obtained in the other differently treated snail meat. Non-significant differences ($P > 0.05$) were obtained in the scores of lime treated roasted and alum treated roasted *Archatina archatina*, lime treated roasted and alum treated roasted *Archachatina marginata*. Lime treated fried and alum treated dried *Archachatina marginata* respectively.

Colour: Statistically, similar ($P > 0.05$) scores of colour were obtained in lime treated roasted *Archatina archatina*, (4.2) alum treated roasted *Archatina archatina* (4.1) and alum treated fried *Archatina archatina* (4.5). Other snail samples gave lower scores of colour ranging between 3.3 and 3.9, lime treated fried *Archachatina marginata* and alum treated fried *Archachatina marginata* having the least scores.

Aroma: the highest significant ($P < 0.05$) aroma score was obtained in alum treated fried *Archatina archatina* (4.9) followed were aroma scores obtained in lime treated roasted *Archatina archatina*, (4.3) lime treated roasted *Archachatina marginata*, lime treated

Sensory Evaluation and Acceptability of Selected Cooking Methods

fried *Archachatina marginata* (4.1) and alum treated roasted *Archachatina marginata* (4.0). The least aroma score of 3.3 was obtained in alum treated roasted *Archatina archatina*.

Texture: the highest texture score in alum treated fried *Archatina archatina* (4.3). Alum treated roasted *Archachatina marginata* and lime treated *Archatina marginata*, had the same textural scores of 3.1.

However, significant reduction ($P < 0.05$) were obtained in textural scores of lime treated roasted *Archatina archatina*. Alum treated fried *Archatina archatina*, lime treated roasted *Archachatina marginata* and alum treated fried *Archachatina marginata* respectively. Non significant ($P > 0.05$) differences also obtained in alum treated roasted *Archatina archatina* and lime treated fried *Archatina archatina*. Lime treated roasted *Archatina archatina* has the lowest textural scores.

Acceptability: higher scores ($P > 0.05$) of acceptability were obtained in lime treated roasted *Archatina archatina*, (4.3) lime treated roasted *Archachatina marginata* (4.2) and alum treated fried *Archatina archatina*. (4.1). The least acceptable was alum treated roasted *Archatina archatina* with the score of 3.5.

Testing of Hypothesis

H_{01} : There is no significant relationship of sensory qualities on the cooking methods of snail

Table 2: Analysis of variance of the respondents

Variable	Source of variance	Degree of freedom	Sum of squares	Mean sum of squares	F calculated	F critical (5%)
Taste	Between	7	64.792	9.256	17.9	2.79
	Within	112	57.94	0.517		
	Total		122.732			
Color	Between	7	16.192	2.313	7.56	2.79
	Within	112	44.153	0.396		
	Total		60.345			
Aroma	Between	7	20.93	2.491	9.19	2.79
	Within	112	40.933	0.305		
	Total		61.866			
Texture	Between	7	23.592	3.31	4.01	2.79
	Within	112	93.998	0.84		
	Total		117.59			

Source: Field Survey (2014).

Table 2 shows analysis of variance of respondents on sensory qualities and cooking methods of snail meat. Also it indicates sensory qualities in term of taste, colour, aroma and texture. The f-cal of taste of snail meat was 17.9, the colour was 7.96, aroma was 9.19 and texture was 4.01. All the F-calculated scores are greater than F-critical. This implies that there is significant difference in the evaluation and acceptability of selected, treated and cooking methods on snail meat by the respondents.

Conclusion

From the result obtained in the study, it was concluded that roasting increased the food nutrients in the snail meat more than the frying did. Marginal differences were obtained in the effect of lime and alum washing of the snail meat. The alum treated snail roasted *Archatina archatina* had better colour, aroma and texture scores.

Moreover, lime treated roasted *Archatina archatina* and lime treated fried *Archatina archatina* had higher significant scores of taste. Both alum and lime treated *Archachatina marginata* had the least scores of taste, colour, texture and acceptability.

Recommendations

Consequent upon the conclusion in this study, the following recommendations were suggested; 1. *Archatina archatina* is recommended ahead of *Archachatina marginata*. Either lime or alum washing is recommended. Moreover, roasting method of cooking is better than frying method.

2. 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., Adeyemo, A., Ogunjobi, J., Alaye, S. & Adelakun, K. (2010). Effect of natural and concentrate diets on proximate composition and sensory properties of Giant Land Snail (*Archachatina marginata*) meat. *Journal of Applied Sciences in Environmental Sanitation*, 5 (2), 185-189.
- Adeosun, A.A & Imerbore, E.A (2001). African giant land snail *Archachatina marginata*, *Journal of animal Production Research*, 8(2) 76-77.
- Akinusi, O.A (2008). Introduction of snails farming, Omega Science Publisher, Tinnose House, Lagos, Nigeria Pp 100-102.
- AOAC (2000). Official method of Analysis of the Association of official Analytical Chemists, 15 Virginia, 123-125.
- Agricultural Research Service Dietary Guidelines Committee. Dietary guidelines for Americans, www.ars.usda/dgac 34-35.
- Brendan, M (2001). *Breeding and Growing Snail Commercially in Australia*: A report for the Rural Industries Research and Development Cooperation 2 pp 1-5.
- 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
- Lulz, C. & Rzytulski, K (2008). *Nutrition and Diet therapy: Evidence based application*, New Delhi Jaypee Brothers Medical Publishers, pp 334-343.
- Malik, A. A & 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.
- Olusanya, J., Bala, F., Eyisi, O. and Olojola, S. (2000) *Exam focus-foods and Nutrition for WASCE& SSCE*, Ibadan University Press, PLC, pp 30-34.
- 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. & Ugwumba 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(1) 159-164.