SENSORY AND QUALITY EVALUATION OF DIFFERENTLY CURED SNAIL MEAT

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ABSTRACT

Sixty four snails of the Species Archachatina marginata were shelled and the edible part properly washed with clean water. The meat were randomly allotted to four treatments; Wet curing, Dry curing, Wet curing with injection, No curing (control). The meat assigned to the different treatments were cooked with dry heat (grilling) and kept at ambient temperature of 27°C for 14 days. Physical and chemical changes during curing and processing were observed. The pH, processing yield, salt accumulation and sensory evaluation significantly differed ($P<0.05$) after two weeks of ageing. Snail meats that were wet cured, dry cured and injected with cure (treatments A, B and C) lost much moisture by dripping and evaporation hence, a significant ($P<0.05$) weight loss was noted in these treatments. Sensory evaluation done showed that the salt content was moderate across treatments. However, wet cured snail meat was ranked best for flavour, tenderness, juiciness and overall acceptability.

Key words: Snail meat, curing, grilling, pH, processing yield.

INTRODUCTION

Snails belong to the phylum mollusca and are used as food, feed or source of revenue (Owolabi, 2009). Snails constitute the major and cheapest sources of protein in Nigeria (Ademolu *et al*, 2004; Fagbuaro *et al*, 2006). They are eaten by the rich and poor, urban and rural dwellers as well as in all continents of the world (ZASBDC, 2008). Popular species of economic interest are *Helix pomatia*, *Helix aspersa* and the West Africa giant snails: *Achatina fulica, Archachatina marginata* and *Achatina achatina* (Cobbinah *et al*, 2008; Owolabi, 2009). Snail meat has a protein content of 18.66 - 20.56% (Okonkwo and Anyaene, 2009) its iron content (45-59mg/kg), low in fat (0.05-0.08%) and contains almost all the amino acids needed for human nutrition (Owolabi, 2009). Snail is high in health benefiting essential fatty acids such as linoleic acids. That is 57% polyunsaturated fatty acids, 15.5% of monounsaturated fatty acids, and 23.25% of saturated fatty acids (Su *et al*., 2004. In folk medicine, the bluish liquid obtained when the meat has been removed from the shell is believed to be good for brain growth in infant's development (Owolabi, 2009). It is believed in some quarters that snail meat contains pharmacological properties or value in counteracting high blood pressure, hemorrhoids, constipation, arteriosclerosis, kidney related diseases and suppression of stroke. The high Iron content of snail meat is considered important in the treatment of anaemia and in the past the meat was recommended as a means of combating ulcers and asthma (Abdul Azeez, 2009; Owolabi, 2009).

Curing is the addition of salt and spices to meat, it is an age old act of meat preservation. Besides adding to flavour and taste of the final product, salt is important in the reduction of water activity in meat. The content of salt in sausages, hams, corned beef and similar products is normally 1.5-3%. Solely common salt is used if the cooked products shall have a greyish or greyish-brown colour (Gunter & Peter, 2007). This study was carried out to assess the effect of curing snails using salt in its solid state or brine,

and to check its effect on pH, yield and consumer acceptability of snail meat.

MATERIALS AND METHODS

Source and dressing of snail meat.

Sixty four snails of the species *Archachatina marginata* were purchased from a public market in Ekiti State, Nigeria. The shells were carefully crushed to remove the body from the shell. The edible parts (the foot) was separated from the visceral mass and was washed with potassium alum ($K_2SO_4Al_2[SO_4]_3.\ 24H_2O$) to remove the slime. Then, they were rinsed with distilled water, mopped free of excess water and weighed. The washed snail meats were randomly allotted across the treatments which were; A: Wet curing, B: Dry curing, C: Wet curing with injection D: No curing (control). Samples were randomly selected from each treatment for organoleptic evaluation, physical and chemical analysis.

Composition of curing brine and mixture: The curing mixture was constituted as follows: 50gm of sodium chloride, 3 gm of sugar and 1gram of additives (0.33gm each of ginger, garlic and white pepper in powdered forms) per liter of water. All the samples (Treatment A-D) were subjected to dry heat treatment using the Crown Star Toaster Grill of the model MC-2012250T. Samples were then aged at room temperature of 27°C for two weeks

Treatments: Each group consisted of sixteen snail meat pieces weighing 830 – 890 grams of fresh snail meat per treatment in a transparent plastic bucket with lid. The treatments were as follows: **Treatment A:** Samples were soaked in curing brine. **Treatment B:** Snail meat samples were dry-salted. The curing mixture was randomly rubbed over each sample. Meat pieces were piled on each other with layers of curing salt between them. **Treatment C:** Meat samples were injected with curing brine at the rate of 8%W/W meat using 5ml syringe with needle. **Treatment D:** The samples were not cured (control), these were refrigerated at 0°C while other samples went through the process of curing. After curing, all treatments were equilibrated for 24 hours at ambient conditions, and were rinsed of excess salt.

Sample preparation: Samples of raw and processed products were separately ground with a meat blender before they were used in analysis.

Evaluation of pH: pH-values were determined by dispersion of one gram sample in 10ml of distilled water using a pH meter (model PHS-25). The pH-values were measured at 25°C.

Measurement of salt Accumulation Values: Salt residue was determined as the chloride using the method described in USDA (2009). 1.5g of ground sample was weighed into 300ml flask with 25ml of 0.1N $AgNO_3$ solution. 15ml of conc. HNO_3 was added and boiled until the meat was digested. $KMnO_4$ was added in small portions while boiling until the solution became colourless. 25ml of H_2O was added to the solution, boiled for 5minutes and cooled to room temperature (27 – 29°C). The flask content was diluted to 150ml with distilled water. 5ml diethyl ether was added and titrated with KSCN solution to a permanent light brown colour. Concentration was calculated as:

$$NaCl\ \% = \frac{[25.0ml - (ml\ KSCN)(R)]\ (NAgNO_3)(5.85)}{\text{sample weight}}$$

Where R= ratio of $\frac{\text{ml } AgNO_3}{\text{ml KSCN}}$

Processing yield: Samples were weighed at each processing stage. Data obtained were expressed as a percentage of the initial weight using the formula:

$$\text{Processing yield (\%)} = \frac{\text{Initial weight} - \text{Processed weight}}{\text{Initial weight}} \times 100$$

Hydrated yield: Samples from each treatment was weighed. A volume of distilled water weighing 5 times weight of meat sample was measured and boiled at 100°C for 10 minutes. The source of heat was removed and the meat was left in the hot water for 10 minutes. Then the sample was removed from the hot water, moped dry and weighed.

$$R_H\ \% = \frac{Hw - Dw}{Dw} \times 100$$

Where: Hw= hydrated weight; Dw= Dehydrated weight of dried meat; R_H = Rehydrated percentage

Organoleptic Evaluation: Sensory evaluation was carried out after two weeks aging using a 9 point hedonic scale with 9 as maximum score and 1 the least score. The selected samples were hydrated, cut into bits and served to the panelists for evaluation

Statistical analysis: Analysis of variance was carried out using Completely Randomized Design according to the methods of SAS (1998).

RESULTS AND DISCUSSION

Results obtained are presented in tables 1 to 3. The pH of the fresh snail meat was 7.40- 7.41 for all treatments at onset, ranging near neutrality. Curing and pH affect in particular the water holding capacity of meat samples. Significant differences were observed in pH values obtained across the treatments at different stages of processing viz curing, grilling and ageing. The trend was similar to that observed by Thorarinsdottir *et al.*, (2001) who reported the pH in fish muscle to have decreased during salting, a rapid drop was observed after dry salting, but a rise in pH during ageing. These changes in pH while processing might be due to protein conformational changes. The high moisture reduction in 'A' might be due to its low pH value. The meat with high pH had better water retention properties (FAO, 1990).

Table 1: Salt Content and pH of Snail Meat

Parameters	A	B	C	D	SEM
Salt content (%)	8.06^{a}	7.79^{ab}	7.17^{b}	7.17^{b}	0.14
pH :					
Fresh snail	7.41	7.40	7.41	7.40	0.00
Cured meat	6.62^{d}	7.92^{b}	7.26^{c}	8.11^{a}	0.13
Grilled meat	5.70^{e}	7.25^{a}	8.01^{b}	8.01^{b}	0.14
Aged meat	7.40^{d}	8.03^{c}	8.13^{b}	8.14^{a}	0.07

abc: Mean on the same row with different superscript are significant ($P<0.05$)

Snail meat naturally contains sodium ions (7.17%) as indicated in table 1. As reported by Maha and James (2003), excess salt has undesirable effects on the flavor, colour and appearance of meat. Application of dry salt can result in unattractive and darker lean. The increased concerns regarding high salt intake and its relative role to hypertension, high blood pressure, and potential heart disease, public health authorities recommend reduction in salt intake. This makes snail meat which has 15% protein, 80% moisture, 2.4% fat (75% of which is unsaturated) an ideal meat for all ages. The weight loss in the meat samples were significantly different ($p<0.05$). Samples treated with the curing salt had lower moisture content hence the weight loss of 33.85%, 29.89% and 27.67% respectively after the curing process. As reported by Okonkwo and Anyaene (2009), the equilibration in salt caused the reduction in weight probably due to osmotic dehydration. Though there was significant loss of weight across the treatment on the application of heat by grilling, the result showed treatments D and B lost more weight (54.84% and 41.58% respectively). The reduced moisture suggests decrease in water activity and increasing microbiological safety and stability especially through inhibition of bacterial organisms (Thorarinsdottir, 2001). Also, there was no significant difference in rehydration property. This implies the meat samples were evenly dried.

Table 2: Processing yield

Parameters	Wet cure	Dry cure	Wet-cure injected	control	SEM
Weight loss (%):					
In cured snail	27.67^{a}	33.85^{a}	29.89^{a}	14.84^{b}	2.32
In grilled snail	41.58^{ab}	30.27^{b}	37.32^{b}	54.84^{a}	3.29
In aged snail meat	52.24^{a}	34.00^{b}	31.11^{b}	37.42^{ab}	3.24
Rehydrated %	31.63	27.52	31.47	35.99	

abc: Means on the same row with different superscript are significant (P<0.05).

Table 3: Sensory evaluation rating of cured meat aged for 14days

Parameters	Wet cure	Dry cure	Wet-cure injected	Control	SEM
Colour	2.33	2.25	1.87	1.87	0.09
Flavour	4.33^{a}	4.12^{a}	3.22^{b}	3.31^{b}	0.16
Tenderness	4.04^{a}	3.50^{a}	3.58^{a}	2.39^{b}	0.21
Juiciness	3.46^{a}	3.29^{ab}	2.79^{bc}	2.25^{c}	0.16
Saltiness	4.22^{b}	3.00^{c}	6.69^{a}	3.00^{c}	0.46
Overall Acceptability	5.12^{a}	5.12^{a}	4.25^{c}	4.59^{b}	0.12

abc: Means on the same row with different superscript are significant (P<0.05).

Fresh snail meat is dark, salting and ageing makes it even darker. All samples were scored as extremely dark. Wet cured meat ranked highest for flavour, tenderness, juiciness and overall acceptability. Wet cured meat with injection was saltiest probably due to brine injection,

CONCLUSION

With the fast growing population of the urban areas, the demand for meat is on the increase. Heliculture is one of the means to meet the increasing protein demand. Wet curing of snail meat in salt and spices for 24 hours before grilling will enhance its organoleptic traits as well as its keeping quality at ambient temperature.

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