

## EFFECT OF DIFFERENT PROCESSING METHODS ON THE MEAT OF *Tympanotonus fuscatus*

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### ABSTRACT

50kg periwinkle was purchased from Oyingbo market in Lagos State, South-west of Nigeria. The bag contained a mixture of two species namely; *Tympanotonus fuscatus* var *fuscatus* and *Tympanotonus fuscatus* var *radula*. They were processed to remove the meat from the shell. The fresh periwinkle meats were dried in the multipurpose produce dryer designed by Nigerian Stored Product Research Institute's (NSPRI) for 15hrs at a temperature of 60°C (Sample A). Fresh and dry periwinkle meats were bought from Iddo Market in Lagos to serve as control (Sample B). The moisture contents of fresh and dry Sample A were 81.20% and 6.52% respectively while that of fresh and dry Sample B were 79.60% and 10.45%. Also, the results of microbial analysis of fresh and dry periwinkle (Sample A) showed sample count of 5.8cfu/g and  $1.2 \times 10^{-1}$  cfu/g respectively. No pathogenic organisms (*E.coli*, *Salmonella* spp.) and fungi were isolated. The microbial analysis carried out on Sample B showed high microbial load (Fresh:  $6 \times 10^3$  cfu/g, Dry:  $1.2 \times 10^3$  cfu/g). Statistical analysis revealed a significant difference ( $p < 0.05$ ) for microbial loads in both fresh and dried samples between Samples A and B while there was no significant difference in the moisture contents of the two samples. Ten per cent (10%) of foreign matters was found in sample B; it also appeared brownish and rough with a repulsive odour. The heavy metals analysis for sample A and B revealed that the amounts present were all within safe limits except for copper at  $35.61 \text{ mg/kg}^{-1}$  in sample B. This is against its safe limit of  $1.20 \text{ mg/kg}^{-1}$  recommended by European Union (EU) standards on fish and other sea foods. Based on the findings from this research work, members of the public should be educated on the importance of proper processing methods on the quality of periwinkle meat.

**Key words:** periwinkle, processing, nutritive value, heavy metals, dry.

### INTRODUCTION

Periwinkle (*Tympanotonus* spp.) are gastropods belonging to the family *Cerithiidae*, they are considered to be the most common and dominant molluscs in the

brackish waters of West Africa (Odu *et al.*, 2010). Around the Niger Delta region of Nigeria, these periwinkles have been found where salinity is as low as 1.5%, the hydrogen ion concentration between 6.5 and

7.1 and temperature range between 27 °C and 34 °C (Gabriel, 1981). Periwinkles are marine molluscs that are represented in the mangrove swamp, lagoons and estuaries by two genera *Tympanotonus* and *Pachymelania*. *Tympanotonus fuscatus* are shellfish dominantly found in brackish waters of the riverine areas of Nigeria where they are highly prolific. *Tympanotonus fuscatus* thrives better in brackish waters that are rich in organic matter and minerals (Gabriel, 1981). The tropical periwinkle (*Tympanotonus fuscatus*) has two varieties; the spiky shell called *Tympanotonus fuscatus var fuscatus* while the smooth granulated one is called *Tympanotonus fuscatus var radula*. Studies have shown that both can exist within the same ecosystem but one variety is usually dominant. Protein supply between 53.30 % -62.50 % has been affirmed by many researchers (Umoh and Bassir, 1977; Adebayo-Tayo and Ogunjobi, 2008). These features had made them a cheap source of protein in many homes when compared to other conventional protein sources. They are also transported to many non-riverine towns and cities, where they are used to prepare various palatable dishes in hotels and restaurants, across the country- Nigeria. The methods of processing periwinkle before consumption differ among the populace. In rivers state, traditionally, periwinkle is washed in water in a basin, immersed completely in water and stored overnight for depuration. Thereafter, it is allowed to drain in a basket and immersed in hot water until it froths (flash Pasteurisation). Periwinkle is drained, cool to room temperature and the meat extracted using sterile nails/needles (Odu, et al. 2010). Some people believe that periwinkles should be thoroughly washed; its pointed ends cut off and then cooked with its shell because of its perceived

medical and nutritive values. Periwinkles are more abundant during the dry season. Harvesting of these species is done by most members of the households. Boiling is the most preferred method for processing these species because it makes them tasty. However, majority prefer smoking the species because it increases their shelf life. Periwinkle species are of utmost importance to the rural people where it is mostly found thus their decline and depletion subsequently could result in loss of income, malnourishment and overall poverty. Periwinkle meat is often neglected by farmers, processors, exporters and researchers. It serves as nutrients and prevents many nutrient deficient diseases. Ogogo, (2008) stated that farming of periwinkles for consumption and export is a source of substantial income to rural Papua New Guineans. More so, information on the abundance, seasonality, methods of harvesting and processing of these available species are yet to be documented. Fresh periwinkle meat sold in the market is of high moisture content; this makes it more susceptible to microbial infection and deterioration. Therefore, there is need to develop appropriate method of handling and processing of periwinkle to meet the protein need of consumers, increase in income of farmers and nutritional intake, encourage the acceptability and minimize post-harvest losses of periwinkle meat.

## **MATERIALS AND METHODS**

50 kg of periwinkle was purchased from Oyingbo market in Lagos State, South - West Nigeria. The bag contains two species namely; *Tympanotonus fuscatus var fuscatus* and *Tympanotonus fuscatus var radula*. They were thoroughly washed with clean water and soaked in water for 24hrs, parboiled for 25mins and drained. The

parboiled periwinkle was allowed to cool at room temperature before removing the periwinkle meat from the shell. The fresh periwinkle meat was dried in the multipurpose produce dryer (designed by the Nigerian Stored Product Research Institute's NSPRI) for 15hrs at temperature of 60°C. The dry periwinkle meat were removed and allowed to cool at room temperature, it was neatly packed in an air tight polythene bag of 100µm thickness and stored at ambient temperature of 27°C. This was regarded as Sample A. Fresh and dry periwinkle meats were bought from Iddo Market in Lagos as Sample B to serve as control. The moisture contents of fresh and dry Samples A and B were determined using hot-oven method as described by AOAC (2002) at a temperature of 103±2°C for 4hrs, while the microbial analysis of the samples A and B were determined using Plate Count Method as described by Bergey's Manual of Determinative Bacteriology, 2005. The Presence of heavy metals in both samples A and B were also determined using Perkin Elmer A Analyst 200 Atomic Absorption Spectrophotometer (AAS) (EU 2001).

### **Statistical Analysis**

Data obtained were subjected to statistical analysis using SPSS. 20. Differences between means and levels of significance of the data were determined using T test at 5% Level of Significance.

### **RESULTS AND DISCUSSION**

The moisture contents of fresh and dry periwinkle meat of sample A were 81.20% and 6.52%, while sample B were 79.60% and 10.45% respectively (Table 1). This does not differ significantly with t-test ( $p > 0.05$ ). The moisture content for sample A indicates that greater percentage of moisture

has been lost which implies that the product can be safely stored. The results of microbial analysis for fresh and dry sample A revealed sample count of 5.8cfu/g, and  $1.2 \times 10^{-1}$ cfu/g respectively. While that of fresh and dry sample B were  $6 \times 10^3$ cfu/g and  $1.2 \times 10^3$ cfu/g respectively. Microbial load was statistically higher in the sample B  $p < 0.05$  (Table 1).

**Table 1: Chemical Analysis and Physical Observations of periwinkle meat.**

PERIWINKLE	Moisture Content (%)		Ash Content (%)		Microbial Load (cfu/g)		Colour		Foreign Matters in 50g
	Fresh	Dried	Fresh	Dried	Fresh	Dried	Fresh	Dried	
NSPRI Processed (Sample A)	81.20a	6.52a	2.26	9.91	5.8b	$1.2 \times 10^{-1}d$	Green	Green	0.0
Market Processed (Sample B)	79.60a	10.45a	2.24	6.90	$6 \times 10^3c$	$1.2 \times 10^3e$	Green	Brown	5.0

Means followed by different letters showed statistical significant difference at  $p < 0.05$

No pathogenic organisms (*E. coli*, *Salmonella spp.*) and fungi were isolated. This is contrary to the findings of Omenwa *et al.*, (2011) and Odu *et al.*, (2010) that reported the presence of *E. coli*, *Bacillus cereus*, *Vibrio*, and *Salmonella* at various percentages. This difference could be attributed to differences in the environment where the periwinkles were obtained. The high microbial load recorded for the market samples was above the  $3 \times 10^{-1}$  cfu/g safe limit for non-pathogenic organisms and thus the dry market sample may be classified as unsafe for consumption. This significantly high microbial load could be attributed to handling and poor processing in the market processed periwinkles. This is similar to findings by Odu *et al.*, (2010).

Physical appearance of Sample A was greenish, and devoid of foreign matters or dirt while Sample B was brownish in colour and foreign matters noticed included broken shells (1.6g), tiny stones and pebbles (1.2g), periwinkle scaly eyes (1.3g) and other dirt (0.9g).

Mechanical drying with multi-purpose produce dryer used for Sample A produced the greenish, neat and high quality periwinkle meat. The brownish colour in Sample B is a clear indication of a poorly processed product, which could be attributed to sun drying method which pre-disposes the product to dirt and microbes during drying. This further, affirms the high microbial count obtained in sample B.

Heavy metals analysis for samples A and B are all within safe limits except for copper at 35.61 mg/kg<sup>-1</sup> in the market sample as against its safe limit of 1.20 mg/kg<sup>-1</sup> according to standards set by European

Union (EU) for fish and other sea foods (Table 2). This high level could be attributed to processing methods used for the market processed sample.

**Table 2: Heavy Metals Analysis for NSPRI and market processed dry periwinkle meat**

Elements	NSPRI Concentration (mg kg <sup>-1</sup> )	Market Concentration (mg kg <sup>-1</sup> )	Safe Limit (mg kg <sup>-1</sup> )
Lead	0.03	ND	1.50
Cadmium	0.03	0.00	0.20
Zinc	1.47	0.19	1.50
Copper	0.25	35.61	1.20
Nickel	0.03	0.06	0.40
Chromium	0.03	0.03	1.00

The safe limits are according to European Union (EU) standards in fish and other seafood, 2001. ND: Not Detected

It was observed that the NSPRI processed dry periwinkle meat maintained its greenish nature, was without particles or foreign matter which makes it more appealing to the consumers, while that obtained from the market appeared brownish, rough and contained 10% of foreign materials. This is an indication of poor processing, handling and storage.

In light of the findings established by this study, members of the public should be educated on the importance of proper processing methods on the quality of periwinkle meat. Local processors of

periwinkle meats should be trained on improved processing methods for post-harvest handling and processing of periwinkle meat. The farming environment from which these periwinkles are commonly found should be monitored periodically for contaminants. Government should encourage farming and marketing of periwinkle for local consumption and export market. Also government should make fund available for more research in this direction. Finally, there is need for further studies on the shelf-life of the processed periwinkle meat.

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