PROXIMATE COMPOSITION AND SHELF LIFE OF POWDERED SMOKED AFRICAN CATFISH (*Clarias gariepinus*)

BY

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ABSTRACT

This study investigated the effect of nutrient profile and shelf life of smoked *Clarias gariepinus* powdered packaged in low density polythene bag for six weeks. A total of ten (10) samples of *Clarias gariepinus* weighing 2kg was sourced from a private farm (Jumik farm), Minna, Nigeria. The samples were smoked for about eight (8) hours in a smoking kiln. The initial proximate composition of the smoked samples were as follows; 65.63%, 4.33%, 2.6% and 17% for protein, ash, moisture and lipid respectively. The smoked products were divided into two parts; one part was stored whole in a wire gauze basket and labelled "A", which served as the control, while the other part was ground pervurized in ponds and packaged in a low density polythene bag and labelled "B". The mean proximate composition of the controlled sample over a period of six weeks were; protein 65.98%, ash 4.79%, moisture 4.5%, 17.3% for protein, ash, moisture and lipid respectively while that of experimental sample were 58.26%, 4.94%, 4.23% and 16.83 respectively. There were no significant difference in the ash, moisture, and lipid content of the powdered product from the control ($P>0.05$). However, the protein value was significantly lower in the powdered products of the smoked *Claria gariepnus*. Therefore, it is better to preserve and store smoked fish as a whole rather than grinding.

Key words: Effect, grinding, proximate, composition, quality, status, *Clarias gariepinus*

INTRODUCTION

Nigerians are large consumers of fish and it remains one of the main products consumed in terms of animal protein. It is cheap and highly acceptable with little or no religious bias, which gives it an advantage over pork or beef (Eyo, 2001). Fish is a very important source of animal protein in the diet of man.

A number of processing techniques are in operation in Nigeria, these include chilling, freezing, salting, canning, drying and smoking (kumolu-Johnson et al.,2010), however, smoking is the most popular method of fish processing(Bako,2005). As documented by Tull (1997) smoking impacts flavours and preservative effect on fish. Smoked fish according to Oyelese (2003) attracts high foreign exchange to Nigerian Government. Fish smoking is particularly relevant in the artisanal fishery sector in that it prolongs the shelf-life of fish and increases utilization of the fish in addition to reducing waste when catches are good as well as increasing protein availability to rural people (Jallow.1995).The African catfish, *Clarias gariepinus* is a very important fresh water fish in Nigeria (Idodo-

Umeh, 2003) and enjoys wide acceptability in most part of the country because of its unique taste, flavour and texture. It is widely distributed and extensively cultured in ponds. This informs the choice of *clarias gariepinus* for the present study. Akande and Auquo-king (2000) observed that a three-hour (3hr) post-slaughter holding of fish at ambient temperature prior to processing still results in good quality hot-smoked fish product.

Quality of smoked fish is dependent on several factors including the quality of the fish at the time of smoking and the nature of wood and type of smoking procedure employed. This is also dependent on the raw material, relative humidity, temperature, density and composition of the smoked, and the time of smoking (Doe and Olley, 1998). Hot smoking is the traditional method of fish smoking in the tropics. Fish is smoked until cooked in order to obtain a product with extended shelf-life, since alternative preservative methods such as refrigeration are absent in remote fishing villages.

The development of fishery machinery and techniques that can be employed for effective fish harvesting, handling, processing and storage can never be over-emphasized especially in this age when aquaculture development is fast gathering momentum in Nigeria (Akinneye, et al., 2007). The objective of this research is to evaluate the proximate composition and the product shelf life of the powdered product of smoked *Clarias gariepinus* over a relative period of storage time.

MATERIALS AND METHODS

Collection of samples

Ten fresh samples of live *Clarias gariepinus* were bought from Jumik farms Minna, with an average weight of the fish was 2kg. The fish were killed, gutted and washed with clean water to remove blood and contaminants. The fish were smoked in a smoking kiln using firewood for 8 hours. The fish were taken to the laboratory and the initial proximate composition was taken as a base for comparison and determination of the proximate composition and the shelf-life of the stored products stored products.

Storage of the smoked fish

The fish samples were stored in two different storage devices. The "whole" sample was labelled "A" and stored in a wire gauze basket, while on the other hand, the ground (powdered) sample was labelled "B" and stored in low density polythene bag. Both samples were kept in the laboratory at ambient temperature for six (6) weeks.

Proximate Analysis

Protein, lipid ash and moisture content of the two smoked samples were determined according to AOAC, 1990.

Microbial counting

Nutrient Agar (NA) was used for the culture of bacteria. In preparing the media, 14g of NA was dispersed in1litre of sterile water. Sterilization of the media was done with the media in a conical flask and sealed with foil paper and then sterilised in the autoclave at 121°C for 15minutes after which it was allowed to cool. The media was shaken vigorously before use.

The aerobic colony counts of the fish samples were done in accordance to pour-plate method by Faunkhauser (2005).

Statistical Analysis

Data generated per each parameter were subjected to T-test, and graphs (bar charts) to show changes in their compositions older time.

RESULTS AND DISCUSSION

The results of this research of this research are presented on and figures1, 2, 3, 4 and 5. This represents the percentage moisture, protein, ash, lipid and bacterial load respectively.

It has been ascertained that water activity has a great influence on the shelf-life of processed fish. The more the moisture content the greater the microbial activity. Fish smoking processes are carried out at temperatures above 80°c, which is enough to cook fish (Eyo 2001; Clucas and Sutcliff, 1981). Smoking is generally aimed at reducing water content and hence reduces the water activity (Sveinsdottir, 1988). Despite the re-absorption of water by the two products, as increase can be observed on figure 1, the percentage moisture in both the products remained below the acceptable level for efficient storage and shelf life. There was no significant difference in the moisture content of both products ($p>0.05$).

Protein in this study account for the largest percentage of the proximate composition of the product stored "whole" than those preserved in powder form as shown in figure 2. This is in line with the report that protein forms the larger constituent of smoked fish tissue (Pannevis, 1993). The initial protein content of the product stored "whole" and that of the powdered products were the same as can be observed in figure 2 in the first week of the product storage. The percentage protein in both the product stored "whole" and that of the powdered form were relatively stable over the period of the storage. The product stored "whole" was at the end of the six weeks of storage having as much as 65.8% protein content while the powdered product had 58.27%. There was significant difference in the percentage protein values ($p<0.05$). The relative reduction of the protein value of the powdered products may be as a result of the increased surface area which promotes microbial activity and enzymatic action and eventual chemical degradation of the product. The lipid composition of the product preserved "whole" was 19.33% whereas that of powdered fish was 17.33% as shown in Figure 4. There was no significant difference in the lipid composition of the "whole" and powdered fish ($p>0.05$). Kumolu-Johnson et al., (2010) in his study on the immediate proximate composition of smoked *Clarias gariepinus* on a fish farm in Lagos discovered the products to have 20.0% lipid. Lipid values of 16 -17% are sufficient enough in human-nutritional considerations.

Figure 4 showed the ash content of the products stored for six (6) weeks. An average of 4.77% and 4.99% percent was recorded for the products stored "whole" and the powder respectively. There was no significant difference between the products ($p>0.05$). This is in line with the observation of Kumolu-Johnson et al., (2010) who recorded immediate post- smoking value of 3.10%. Ash represent the mineral values and relatively important in the development of skeletal materials, particularly the bones.

The microbial loads of the products showed that the sample packaged in low density polythene bag has more bacteria. This may be due to localisation of heat in the polythene bag which favour the growth of bacteria

Table 1:Proximate composition of the products

Parameters	Treatment	Mean±S.D	T	p-value
Moisture content	Sample A	4.5±1.23	0.445	0.67^{ns}
	Sample B	4.2±0.95		
Crude protein	Sample A	65.1±1.00	3.55	0.005
	Sample B	59.5±4.36		
Lipids	Sample A	19.33±1.6	0.96	0.360^{ns}
	Sample B	17.33±1.96		
Ash content	Sample A	4.77±0.27	-4.94	0.632^{ns}
	Sample B	4.94±0.77		

There is significant difference if ($p<0.05$)

Table 2: Mean microbial count

Parameter	Mean and standard deviation
Sample A	31.75±7.88
Sample B	38.00±12.00

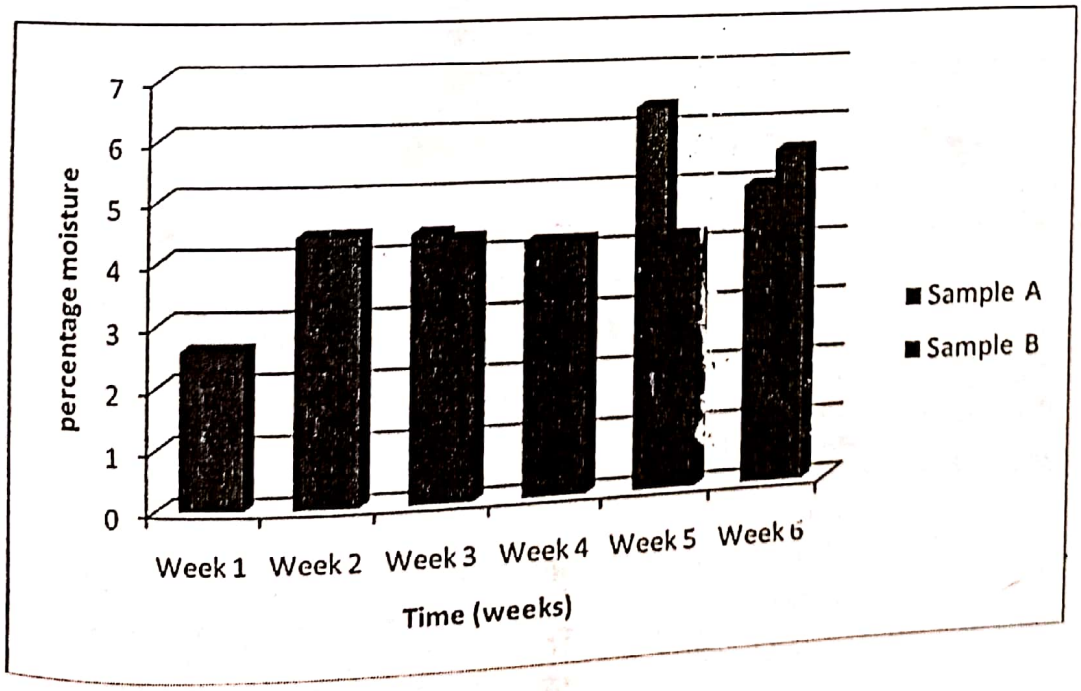

Figure1: Interaction between the moisture content of the fish stored using two different storages method. There was no significant difference in the moisture content of both samples ($p>0.05$).

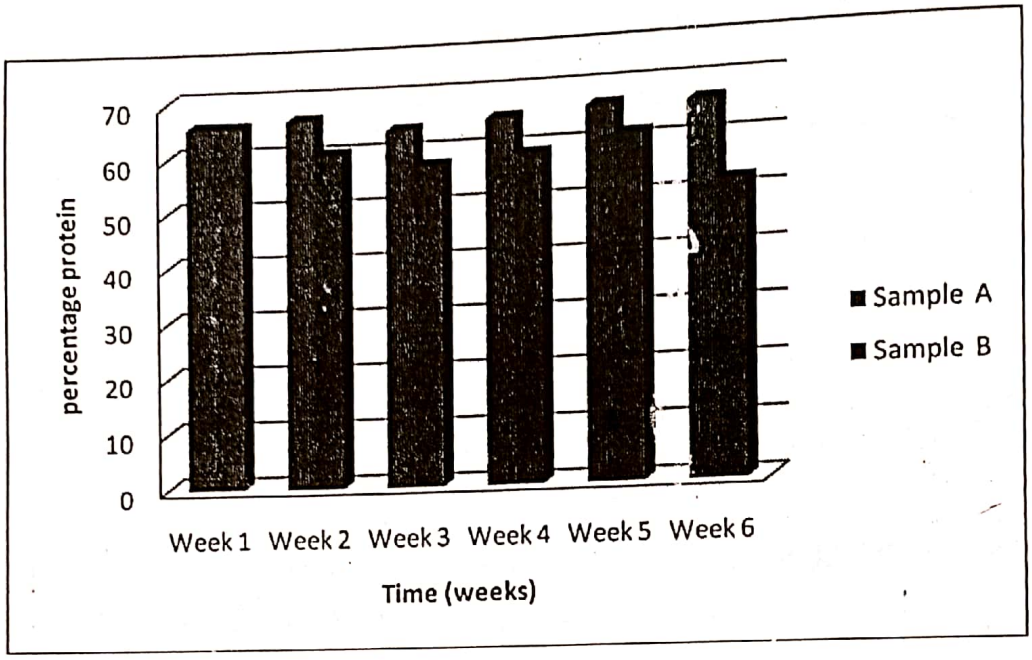

Figure 2: Interaction between the protein content of the fish stored using two different storage methods. There was significant difference in the protein content of both samples ($p<0.05$).

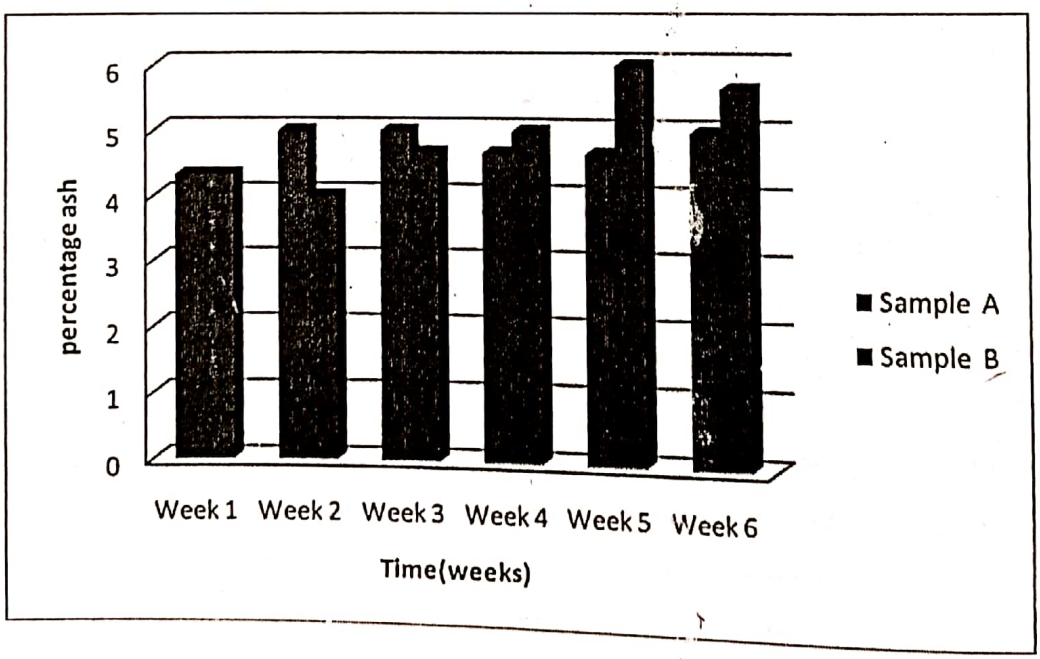

Figure 3: Interaction between the ash content of the fish stored using two different storages. There was no significant difference in the ash content of both samples ($p>0.05$).

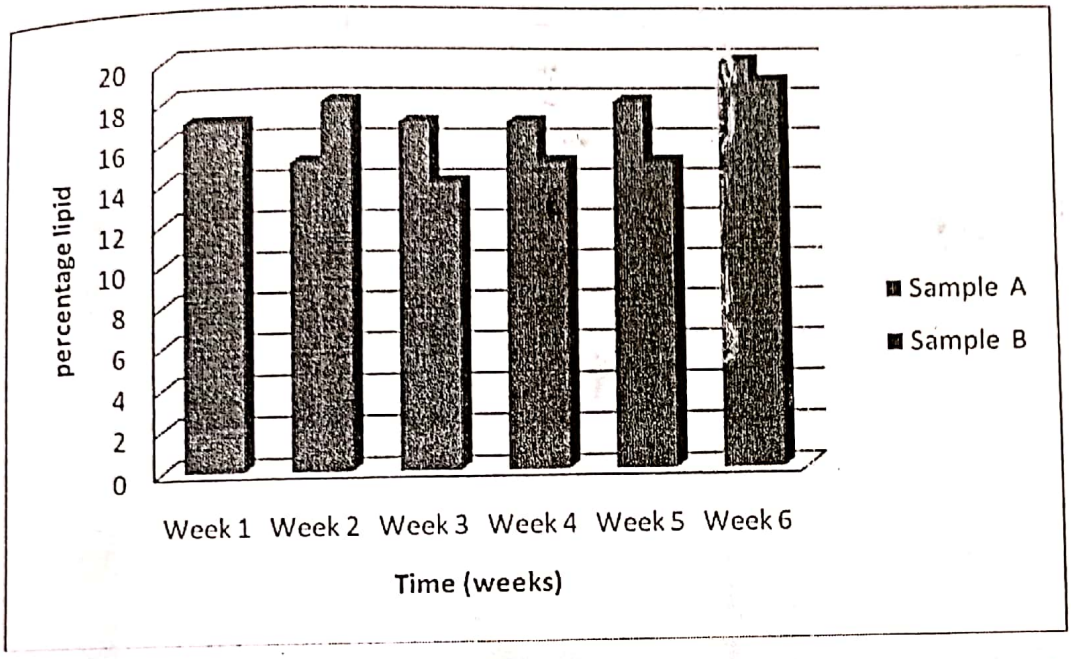

Figure 4: Interaction between the lipid content of fish stored using two different storages. There was no significant difference in the lipid content of both samples ($p>0.05$).

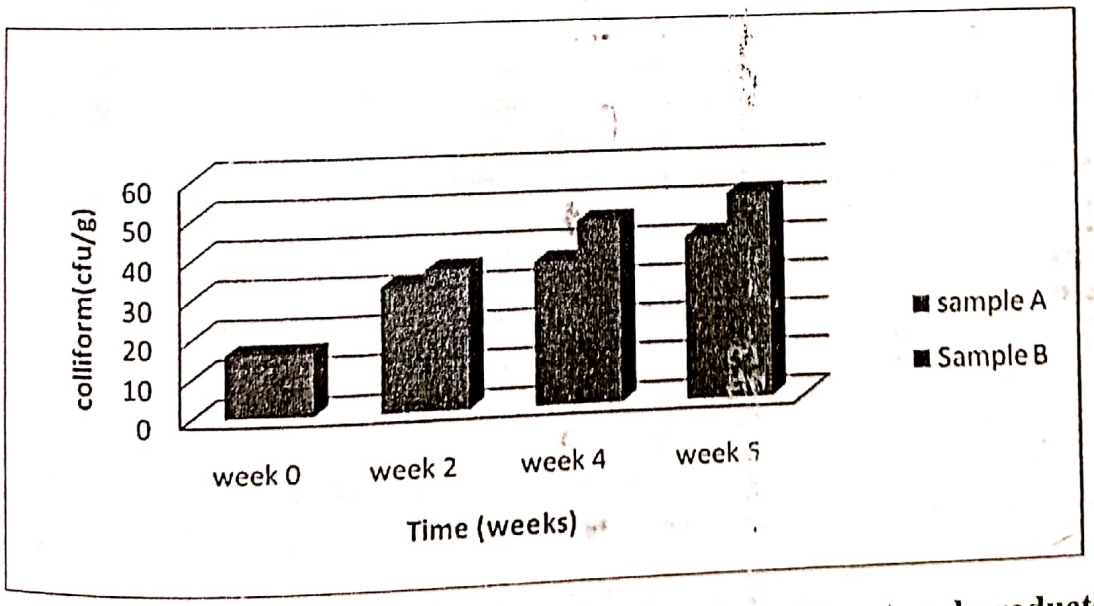

Figure 5: Interaction between the microbial loads of the stored products. Microbial load is relatively higher in the powered product

CONCLUSION AND RECOMMENDATIONS

The study showed that smoked *Clarias gariepinus* samples stored in "whole" form has proven to be more efficient and reliable form of fish processing and storage at ambient temperatures. The products were of better nutritional quality and shelf life compared to the powdered products neatly stored in polythene bag. The continuous use of this method of preservation is inevitable. It is therefore recommended that research on how to improve the packaging and shelf life of the powdered products should be carried out in order to make this product available, for our teaming population.

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