*Available online at http://www.journalcra.com*

*International Journal of Current Research*
*Vol. 4, Issue, 05, pp.057-059, May, 2012*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

**ISSN: 0975-833X**

## RESEARCH ARTICLE

# EFFICACY OF BRINE ON NUTRIENTS AND KEEPING QUALITIES OF SMOKED CATFISH (*Clarias gariepinus*)

**Agbabiaka, L.A[1]., Eke. L.O[2], Nwankwo. F. C.[2] and Ojukannaiye A. S[1].**

[1]Department of Fisheries Technology, Federal Polytechnic Nekede Owerri, Nigeria
[2]Department of Food Technology, Federal Polytechnic Nekede Owerri, Nigeria

**ARTICLE INFO**

***Article History:***
Received 24th February, 2012
Received in revised form
27th March, 2012
Accepted 25th April, 2012
Published online 30th May, 2012

***Key words:***
Assessment,
Brine,
Catfish,
Storage,
Smoking.

**ABSTRACT**

A week study was conducted on the efficacy of brine pre-treatment on *Clarias gariepinus* smoked with *Dialium guineensis* using storage quality and nutrient assay as parameters. A total of 20 specimens of *C. gariepinus* with mean body weight of 475 ± 25g were divided into two groups of ten; one group was immersed in 10% brine solution while the other group was unsalted. They were smoked with *Dialium guineensis* for 4 hours, withdrawn and kept at room temperature for one week. Proximate analyses of the two treatments revealed no significant difference ($P > 0.05$). There was an observed increase in values of all the nutrients in the salted smoked samples , similar trend was reported in organoleptic tests which also indicated that there were no significant differences ($P > 0.05$) among the sensory parameters such as texture, test, colour and flavor among the treatments.This experiment has shown that salt pre-treatment has little or no effect on nutrient assay but slightly improved the taste and flavor of the smoked products ($P> 0.05$).



## INTRODUCTION

Fish plays an important role as a major source of animal protein by contributing over 50% of the animal protein in Nigeria, especially the rural poor (Miller, 2003). Fresh water fish makes up about 69.6% of the 60% consumed from Catfish culture (Fish net, 2009). *Clarias gariepinus* is the most cherished fish cultured in Nigeria with good flavor and high feed conversion (Garibaldi,1996;Williams *et al*., 2007). Fish as a highly perishable product is prone to postmortem changes that quickens the rate of fish spoilage and subsequent wastage of total fish catch worldwide by 50% (Essumaro, 1992). Ime-Ibanga and Fakunke (2008) observed that postharvest losses accounted to 50% of fish production in the developing countries. The assessment of the quality of fish stored in ice by chemical methods has been widely examined (Balogun, 1987). Furthermore, the technologies of chilling, freezing and canning are not usually common due to high cost of running power generating plants caused by incessant power outage. Smoking of fish as a traditional method of preservation is a viable alternative to curtail wastage of unsold fishes (Eyo, 200, Andrey *et al*.,2006,Fakunle,*et al.,*2009). The dispersed particulates are the tars, wood resins and compounds of high and low boiling points, while the dispersed gaseous phase are the carbonyls, organic acids, phenols, alcohols and hydrocarbons (Iwe, 2002). The effect of smoke on the nutritional composition of fish has been observed and recorded (Effiong and Fakunle, 2009). This is because heat and exposure to high concentration of salt lead to both chemical and physical alteration of the fish biomaterial (Balogun and Sunbella, 2001). This study is therefore designed to provide useful guide on the effect of salt pre treatment on the nutrient composition and organoleptic assessment of smoked *Clarias gariepinu*s using sensory evaluations.

***Corresponding author:*** adegokson2@yahoo.com

## MATERIALS AND METHODS

### Sample Preparation and location

Twenty fish samples *of Clarias gariepinus* used for the study were collected from fish farm of federal Polytechnic, Nekede, Owerri, Imo State, Nigeria. The freshly caught samples were weighed with a Mettler top loading balance, degutted and washed thoroughly with tap water to remove traces of blood and unwanted particles. The dressed samples were divided into two batches of ten each and dressed weight taken. One batch was immersed in 10% brine solution for 30 minutes while the other was immersed in distilled water for same 30 minutes.

### Brine Preparation

10% brine solution was prepared by dissolving 5kg table salt (NaCl) in 45kg of distilled water and was agitated for about 5minutes to dissolve properly.

### Smoking Process

*Dialium guineensis* wood was purchased from a local firewood dealer at Nekede Market square in Owerri, Imo

State, Nigeria. The immersed samples were then laid on a rack placed over the smoking kiln. The smoking exercise lasted for four hours, with turning of fish at intervals to effect uniform smoking. The smoked fish were covered with cartons to retain heat and prevent contamination by dusts and flies. Thereafter, smoked product were removed from the kiln and allowed to cool at room temperature.

**Sensory Evaluation**

Smoked fish were submitted to ten trained test panel from Food Technology Department of the College to evaluate the sensory qualities such as texture, taste, aroma and colour. These parameters were assessed on a nine (9) points hedonic scale (9 = excellent; 8 = very good; 6 = good; 4 = fair; 2 = poor and 0 = bad) according to Afolabi *et al.* (1984). Panelists filed in a single line to assess the smoked products were requested to mask their mouth with water after tasting each sample to avoid bias in judgment/evaluation. The storage qualities (sensory evaluation) of the smoked fish were examined daily between 9.00-10.00am for a period of 7 days.

**Proximate Analysis**

Fish samples weighing about 50g were collected from each treatment on replicate basis respectively and taken to the laboratory for nutrient assay analyses such as crude protein, fat, crude fiber and ash contents using standard methods (AOAC, 2000).

**Statistical Analysis**

Data collected were subjected to one way analysis of variance (ANOVA), while means were separated by student "t" test (Steel and Torie, 1980)

## RESULTS AND DISCUSSION

The weight characteristic of catfish smoked with *Dialium guineensis* wood is shown in table 1. Reduction in weights of the smoked fish is attributed to the heat and dryness associated with hot smoking and reduction in water activity of the smoked product (Abolagba and Osifo, 2004). The nutrient composition of catfish smoked with *Dialium guineensis* is shown in table 2. The high value of the nutrients showed that *Dialium guineensis* had little or no inhibitory effect on the fish protein, though smoking has been found to cause nutrient loss due to associated heat flow of gases and interaction of smoke components with protein (Ojewola *et al.* 2003).

This could be that the interstitial moisture in the fish tissue acts as an absorbent that cause the uptake of smoke by fish during the smoking process. Salting in fish also reduces the moisture content of fish thereby discouraging the growth of microorganisms that would have caused decay and fish spoilage. Salt affects the water activity ($a_w$) of substrate by reducing the amount of moisture (Effiong and Fakunle, 2009; Ihekoronye and Ngoddy 1985). The fat content was slightly higher in smoked fish without salt than the salted, though both treatment were not significantly different ($p>0.05$). Eyo (2001) established that the addition of salt to fish play an important role in accelerating the reaction of fat and oxygen that deteriorate catfish hence Ogali (1994) reported that the reduction in percentage fat is due to oxidation. Result of sensory evaluation indicated that there was no significant difference ($P> 0.05$) in the texture between smoked fish samples throughout the storage period (Table 3). However, the judgment on taste of the two groups of smoked catfish (0% brine and 10% brine) were similar though, the samples pretreated with brine had higher score ($P> 0.05$) than unsalted smoked samples.

**Table 1. Weight characteristics of *C. gariepinus* smoked with *Dialium guineensis***

| Initial wt. of fish (g) | Wt. after Gutting (g) | Wt. after Smoking (g) | Total wt. loss (g) | % wt. loss (g) |
|---|---|---|---|---|
| 500 | 400 | 200 | 300 | 60 |
| 450 | 400 | 180 | 270 | 60 |

**Table 2: Nutrient Composition of *C. gariepinus* smoked with *Dialium guineensis***

| PARAMETERS | SAMPLE A | SAMPLE B |
|---|---|---|
| Crude Protein | $67.28^{a}$ | $68.07^{a}$ |
| Fat | $20.01^{a}$ | $21.19^{a}$ |
| Moisture | $2.49^{a}$ | $4.11^{b}$ |
| Ash | $5.3^{4a}$ | $4.94^{a}$ |
| NFE | $0.78^{a}$ | $1.84^{a}$ |

$^{ab}$Means within row with different superscripts differ significantly ($P < 0.05$).
Sample A = Fish treated with 0% brine, Sample B = Fish treated with 10% brine,
NFE =Nitrogen free extract

**Table 3: Sensory assessment score of smoked catfish for samples A and B**

| Parameters | Samples | Brine Concentration | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Texture | A | $6.2^{a}$ | $6.8^{a}$ | $6.7^{a}$ | $6.8^{a}$ | $6.0^{a}$ | $6.1^{a}$ | $6.1^{a}$ |
| | B | $6.5^{a}$ | $6.2^{a}$ | $6.9^{a}$ | $6.3^{a}$ | $6.3^{a}$ | $6.1^{a}$ | $6.2^{a}$ |
| Aroma | A | $7.2^{a}$ | $6.9^{a}$ | $6.4^{a}$ | $6.0^{a}$ | $6.4^{a}$ | $4.8^{b}$ | $3.2^{c}$ |
| | B | $7.9^{a}$ | $7.2^{a}$ | $6.6^{a}$ | $6.7^{a}$ | $6.3^{a}$ | $6.1^{b}$ | $3.2^{c}$ |
| Appearance | A | $6.7^{a}$ | $6.3^{a}$ | $6.0^{a}$ | $6.0^{a}$ | $5.7^{a}$ | $6.0^{a}$ | $6.2^{a}$ |
| | B | $6.4^{a}$ | $6.8^{a}$ | $6.9^{a}$ | $6.9^{a}$ | $7.0^{a}$ | $5.9^{a}$ | $6.5^{a}$ |
| Taste | A | $6.4^{a}$ | $6.3^{a}$ | $6.3^{a}$ | $6.8^{a}$ | $5.3^{b}$ | $3.8^{c}$ | N T. |
| | B | $7.9^{a}$ | $6.8^{a}$ | $6.6^{a}$ | $6.4^{a}$ | $5.1^{b}$ | $4.1^{c}$ | N T. |

$^{abc}$Means within columns with different superscripts differ significantly ($P < 0.05$); Sample A =Fish treated with 10% brine solution.
Sample B = Fish treated with 0% brine solution ; NT = Not tasted due to spoilage

The mean scores for taste decreased as the storage period increased. Nevertheless, it was observed that the sample pre-treated with brine was still fairly tasty with value of (4.1) at the sixth day of storage unlike the unsalted sample that was scored poor (3.8). The improvement in taste of salted fish samples and fairly better consumer acceptability is in agreement with the report (Eyo, 2001) that brining improves taste and also reduces water activity in the product, thereby reducing microbial growth. However, the taste acceptability is attributed to the (hard wood) *Dialium guineesis*, whose chemical compounds such as carbonyl, phenols, syringols and guaiacols influence taste and aroma of smoked product (Eyo, 2001). The tastes of both groups of smoked fish were unpleasant on the seventh day probably due to the onset of deterioration/spoilage of the fish. The decline in aroma and taste of fish as storage period increased may perhaps be due to onset of spoilage as a result of degradation of protein with subsequent formation of various products such as hypoxanthine and tri-methylamine development of oxidative rancidity and action of micro-organisms (Johnson *et al,* 1994). The colour of the smoked fish products (salted and unsalted) were similar with fairly constant scores from the first day to the seventh day of storage ($P > 0.05$); but same was not observed with aroma which declined as the storage period increased (Table 3). There was an observed decline in aroma at the sixth day with unsalted sample while salted sample maintained the aroma till seventh day ($P < 0.05$).

## REFERENCES


Abolagba, O.J. and S.J. Osifo (2004). The effect of smoking on the chemical composition and keeping qualities of catfish (*Heterobranchus bidorsalis*) using two energy sources. Journal of Agric. Forestry and Fisheries (JAFF) 5(1): 27-30.

Audrey. M., B. Audia and J.B. Olive (2006). Effect of processing on nutrient content of foods. Cajarticles No 3c 2004:160-164.

A.O.A.C. (2000) Association of Official Analytical Chemists. Official methods of chemical analysis.17th Edition. Washington, D.C, U.S.A

Balogun.A.M.(1987).Effect of sun drying on the proximate composition and lipid characteristics of two fresh water *Clarias gariepinus*. Food chemistry 26:1-11

Balogun J.J.C. and S.A. Sumbella (2001) Evaluation of flavour and colour of *Clarias gariepinus* (Linneus) Smoked with different tropical Savannah hardwoods. African journal of science and Technology (1&2): 34-36

Clucas I.J. and A.R.Ward (1996). *Post harvest fisheries development*. A guide to Handling preservation, processing and Quality. Chatham Maritime, Kent ME44TB, United Kingdom.

Effiong.B.N.and Fakunle, J.O (2009). Effect of wood type on the nutrient composition of smoked dried *Citharinus citharus* . Proceedings of the 24th Animal conference (FISON) at Akure.16-18.

Essuman,K.M.(1992).*Fermented fish in Africa*: A study on processing, marketing and consumption, FAO, Fisheries Technical paper. 329: 8pp.

Eyo A.A (2001). *Fish Processing Technology in the Tropics*. University of Ilorin press Nigeria. 155-166.

Fakunle, J.O.S, O.E Sadiku, B.N. Effiong and Ubanga, U.I. (2009). Effects of smoking and fermentation processes on the nutrient components of Tilapia (*Oreochromis niloticus*).Nigerian Journal of Fisheries. 6(1&2):58-62.

Fish Network (2009). A quarterly publication of the Fisheries Society of Nigeria (FISON). 5(4):7-11.

Garibaldi, L (1996). List of animal species used in aquaculture. FAO Fisheries circular No.914.

Haruna, A .B.(2003). *Aquaculture in the Tropics*. Theory and practice. Al- Hassan publishers. 210-227p

Ihekoronye, A.I. and R.O.Ngoddy (1995). Integrated food Technology for the Tropics. Macmillan publishers LTD. London and Basing stock:274-291pp.

Ime- Ibanga. U and J.Fakunle (2008). Effect of smoking and Oven drying on the proximate composition and sensory Qualities of salted and saltless *Clarias gariepinus*. Proceeding of the 23rd Annual conference of fisheries soc. (FISON) held at Kaduna.71-73p.

Iwe M.O (2002). *Handbook of Sensory Methods and Analysis.* Rejoin communication services, Enugu, Nigeria

Johnson, W.A; F.J. Nicholson and A. Roger (1994). Freezing and refrigerated storage in fisheries. Stroud. Series. FAO Fisheries Technical Paper 340: 143.

Miller, J.W. (2003).Inception Report of Aquaculture and inland fisheries Project of the National special program for food Security.44pp.

Ogali,E.L.(1994).Review on advances in fish handling, preservation and storage technology in Nigeria. NIFFR Annual Report. New Bussa: 114-119pp.

Ogbeibu, A.E. (2005).Biostatistics, A practical approach to research data handling. Mindex publishing company LTD.153-162

Ojewola,G.S, A.S Eburuaja, F.C.Okoye, A.S Lawal and A.H Akinimutimi(2003) Effect of inclusion of grasshopper meal on performance, nutrient utilization and organ of Broiler chicken. J. Sustain Agric Environ, 5:19-25

Steel, G.D. and Torie, T.H (1980) Principles and procedures of statistics, McGraw-Hill Book Co. Inc, New York 633PP

Williams B.B, Olaosebikan. B.D, Adeleke, A and Fagbenro, O.A. (2007).Status of African Catfish farming in Nigeria. Proceeding of a workshop on the Development of Genetic improvement program for African catfish *Clarias gariepinus* 5-9 November.2009:49-56


*******