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EFFECTS OF NIOMR SMOKING KILN AND OVEN DRYING ON THE CRUDE PROTEIN, MINERALS AND VITAMINS OF CATFISH Clarias gariepinus

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ABSTRACT
The effects of two different preservative methods, NIOMR Smoking Kiln and Oven drying on Crude Protein minerals and Vitamin of *clarias gariepinus* were studied. Clarias *garrepirius* were obtained from the fish farm of African Regional Aquaculture Centre, Aluu, Port Harcourt. The crude protein, minerals and vitamins of the fresh fish were determined immediately while two other batches were separately dried using oven at 50°c for 30minutes and NIOMR Smoking Kiln at 70°c for 3 hours.
Result of the crudeprotien of fresh fish was 21.84+1.10 which increased to 59.53+1.88 and 35.41+1.00 in both NIOMR smoking and oven, respectively. This means that, there was a significant different in both dryers on the crude protein. This will improve the knowledge and capacity of rural women and agricultural communities on the appropriate processing method for fish. The mineral and vitamins of oven dried and NIOMR Smoking kiln were analyzed. The vitamin content of both the fish, dried and smoking kiln shows no significant different except in vitamin A which was significant ($p<0.05$).There was significant different ($p<0.05$) in the mineral content of the two different drying method except in sodium, Potassium and Phosphorus of the drying method. This result indicates that the two drying methods have effects on the nutritional quality of catfish.

Key words: ***smoking, production, preservative Research, Quality.***

INTRODUCTION

Fish is a highly nutritious with high protein content. However, it is asuitable medium for growth of micro-organism after death. The traditional methods of processing are often inefficient and unhygienic involving substantial post harvest losses in terms of mould, fragmentation, infestation by blonofiles and beetles, loss of quality by charring etc. the traditional or conventional methods can be improved and losses be reduced by the use of NIOMR smoking kiln and oven. It is instructive that the method has the effect of imparting a pleasant flavour to the product besides the preservative effect of the smoke itself (Burgress et al, 1965, Tull, 1997).
But smoke fish being a foreign exchange earner for Nigeria, researchers are concerned about the quality of products, this was apparent from the investors forum that was jointly organized recently by the Nigerian institutes for oceanography and Marine Research and the Raw Materials Research and Development Council, where participants called for better handling, processing and packaging of products to meet the required standards set by authorities in the countries of export (Oyeleye, 2003). Although oven-drying is faster, can relatively be controlled and ensures proper security of the fish product compared to NIOMR smoking kiln, NIOMR smoking kiln will be particularly helpful in rural areas where oven is in non-existence (Adesilu and Sydenham, 2007). Thus, as dried fish continues to occupy its important place as a delicacy in the dishes of Nigeria and technologies. While drying of fish could extent the keeping quality thereby increasing the availability of fish all year round (Afolabi, et al; 1984). Fish smoking and drying naturally developed along the coastal fishing communities, the main objective being preservation of the catch for use over a long period of time. The most important factor affecting the quality of a fish product is the freshness of the raw fish immediately prior to processing. Poor quality raw fish produces poor quality end product. Processing can only help to slow down the rate of deterioration and using spoiled fish as the raw material can only produce poor quality product. NIOMR Smoking kiln address the problems of traditional processing methods which predispose the artisanal catch to large scale post harvest losses estimated at over 20% of the total landed weight. Poor quality product due to fish being damaged by difficult handling of the fish on wire nets used to support them over the fire, loss of smoke and heart, resulting in uneven smoking, limited capacity of smoking larger volumes of fish, time consuming in terms of amount of time needed to handle the fish in smoking.

MATERIALS AND METHODS

Freshly harvested catfish (Clarias gariepinus) were obtained from the fish pond of African Regional Aquacultural Centre. The weight and length of the fish were 200+__2.27g and 0.98 respectively. The fish samples were washed with tap water to remove dirt, rinsed with distilled water and were shared into three equal parts. The mineral content, crude protein and vitamins of one part of the fresh catfish in the Laboratory. While the other two parts were dried using NIOMR smoking kiln and oven modern a temperature of 60° C for 2 hours and 50°C for 30 munities respectively.
Smoking process
The two other batches of fish were gutled and washed thoroughly with clean and the 1st samples of fish placed inside the kiln at the temperature of 60°C for 4 hours and the other place in the oven at a temperature of 50°C for

30 minutes. The smoke from the kiln was produced by the burning of charcoal only and that from oven was from flame from gas cylinder. They were allowed to cool for 30 minutes flame from gas cylinder. The two batches of fish for drying were homogenized using a kitchen blender kept in labeled airtight container and then analyzed in the National Institute Umudike Laboratory.

Determination of minerals

The minerals content of the samples was determined by the dry ash extraction method following which specific minerals element. 2.0g of the sample was burnt to ashes in a muffle (as in ash determination) the resulting ash was dissolved 100ml of dilute hydrochloric acid (1m Hcl) and then diluted to 100ml in a volumetric flask using distilled water. The digest so obtained was used for the various analyses.

Determination of potassium (k) and content

2 g of the sample was weighed into small porcelain crucible and ashed in the furnace at 650°C for three hours. The ash was extracted by half filling the crucible with 2ml Hcl, boiled gently and the solution was transferred to a 50ml beaker using Pasteur pipette. The precipitates were washed with distilled water, filtered into the filtrate and solution made up to 50ml mark distilled water. K was determined using flame photometer (model: Jenway PFP 7) with standard solution white Fe was determined by Atomic Absorption spectrophotometer (AS) Bulk Scientific Model 210/211 VGP with standard solutions.

W- Weight of sample analyzed

Ew- equivalent weight

V_F – Total volume of extract

N- Normally of EDAT =0.02m

V_A – Vol of extract titrated

T- titre valve less black

Determination of potassium and sodium

Potassium and sodium in the sample extract was determined by flame photometry the instrument was set up according to sample was calculated with reference to the graph and obtained as follows.

$$\text{Kmg/100g} = \frac{100}{w} \times \frac{VT}{T} \times 10^{\frac{1}{3}} \times XXD$$

Where wt of sample used

Vt = total extract volume since 1ml was siphoned into the instrument.

Concentration from the graph

D- dilution factor where applicable

Determination of phosphorus

Phosphorus in the sample was determined by the vanadomohybdqate (yellow) spectrometry at a wave length of 420nm described by pearson.

Phosphorus content was given by the formular

V_F – Total volume g/100g = 100/10 X Au/AS X C XV_F V_A where of filtrate W-weight of sample analyzed

Va Volume of Au – absorbance of standard of solution

Determination of vitamins

Vitamin determination

The method of the association of vitamin chemists was employed. A measured weight (5.Og) of each processed sample was dispersed in 30m1 absolute alcohol 3ml of 50% potassium hydroxide so1uon was added to it and boiled under reflex for lOmins. After cooling rapidly in running water 30ml of distilled water.

Au = absorb

Determination of vitamins

The B-complex vitamins (thiamin, riboflavin and niacin) were determined using spectrophotometer method.

Determination of crude protein

Crude protein was determined according to AOAC (1990) a 5m1 concentrated sulphuric J acid in a kjedhahl flask until the mixture was clear . The mixture was made

up of to 1 OOml with distilled water aliquots of 5m1 taken for absorbed in boric acid and.

reacted with 0.OIN Hcl. The Nitrogen value was multiplied with 6.25 to obtain crude protein.

Statistical Analyses

Statistical analyses were performed using SPSSV. IS.O for windows. Analysis of variance (AMOVA) was used and statistical significance was set at $P<0.05$. The least significant difference was used to separate differences in treatment means.

Table 1: Mineral and crude protein levels of processed fish using different methods(mean±SD)

Fish sample	Mineral levels (mg/100g)						
	Mg	Na	K	Fe	Ca X	Cp(	P
Fresh (control)	209.46 ± 1.1^{a}	116.50 ± 1.21^{a}	187.78 ± 1.01^{a}	6.78 ± 0.39	221.64 ± 1.01^{a}	21.84 ± 1.10^{a}	131.51 ± 1.009^{a}
Dried	$216.76^{b} \pm 10$	118.52 ± 1.01^{b}	194.24 ± 1.12^{b}	8.78 ± 0.91^{c}	224.78 ± 2.01^{b}	59.53 ± 1.88^{c}	134.71 ± 2.12^{b}
Smoking Kiln	$215.77^{b} \pm 1.01$	119.54 ± 1.88^{b}	192.88 ± 2.14^{b}	8.95 ± 0.00^{b}	Increase	Reduce	Slightly diff.

Means within the column with different superscripts are significantly different ($p<0.05$)

Table 2: vitamins levels in processed fish using different methods (meal SD)

	VITAMINS					
Fish sample	B_1(%)	B_2 (%)	B_3 (%)	E(mg/100g)	C(mg/100g)	A(mg/100g)
Fresh	0.08 ± 0.01^{a}	0.06 ± 0.01^{a}	1.11 ± 0.10^{b}	0.45 ± 0.01^{a}	0.86 ± 0.01^{a}	15.42 ± 0.10^{c}
Dried	0.05 ± 0.01^{a}	0.04 ± 0.01^{a}	0.96 ± 0.01^{a}	0.39 ± 0.10^{a}	0.62 ± 0.01^{a}	11.28 ± 0.20^{a}
Smoking Kiln	NS	NS	SN	NS	NS	SN

Means within the column with different superscripts are significantly different ($p<0.05$)

Result of the crude protein of fresh fish was 21.84 ± 1.10 which increased to 59.53 ± 1.88 and 35.41 ± 1.00 in both NWMR smoking and oven, respectively. This means that, there was a significant different in both dryers on the crude protein. This will improve the knowledge and capacity of rural women and aquacultural communities on the appropriate processing methods for fish.

CONCLUSION

The result obtained in this study showed that there were significant influences of the two drying process on the crude protein, iron,calcium and vitamin A. there were no significant difference in the vitamin content of the catfish. NIOMR Smoking kiln increased the nutritional quality of fish than oven dried method. This study provided a apossible application of NIOMR Smoking Kiln as an efficient drying process for fish.this kiln gives good and efficient in the use of charcoal/firewood, low fuel consumption, uniform fish drying, temperature distribution is very good, produces dry fish that are not hygienic and free from grits and heavy smoke deposits, adaptable to sale of operation. In the oven dried, it's use is limited in the poor resource communities in the developing countries because of the cost availability of gas. This study emphasizes the need of improved smoking kiln for drying of C. gariepinus to the nutritional quality of fish. The knowledge obtained from this study will improve the capacity of rural women and aquaculturist communities on appropriate drying method for fish. This study provides a possible application of NIOMR Smoking Kiln as an effective drying method.

REFERENCE

Burgress, GHO; Cutting, CL; Lovern, J.A waterman, jj (1965). Fish handling and processing Tory Research station, ministry of Technology Edinburg, Her majesty's station office, London pp 70-101

Oyeleye, O. (2003). Export potentials of smoked fish trade in Nigeria. The Guardian 19(8916); 27 Guardian Newspapers, Lagos, Nigeria

Tull. A (1997) food and Nutrition. 2nd Ed. Oxford University Press. Oxford U.k pp.104-109

Tao w. and Linchan on 2008. influence of hot drying and microwave drying on nutritional and odorous properties of grass carp (tenopharyngodon idellus) fillets. Journal of Food chemistry, 110: 647-653

Adesula E and Sydenham D. 2007. the fresh water fishes and fisheries of Nigeria, p. 397 Macmillan Nigeria publishers, Lagos.

Afolabi O., Arawomo G. and Oke O. 1984.quality changes of Nigeria traditional processed freshwater species: Nutritive and organoleptic changes. Journal of food Technology, 19; 333-340.

Gokoglu N., Verlikayup. And lengiz E 2004. effects of cooking method on the procimate composition and mineral contents of Rainbow Trout (Oncorhynclus mykiss) food chemistry 84:19 -22Puroustein P., Judprasong K., kettwan E., Va-sanaclih k., Nak ngamanong y. and Bhattachiyee L. 1999. proximate composition of rwa and cooked that fresh water and marine fish. J. food composition and Analysis, 12:416.