

AN APPRAISAL OF FISH PROCESSING AND HANDLING IN YOLA NORTH LOCAL GOVERNMENT AREA OF ADAMAWA STATE: THE QUESTION OF APPROPRIATE TECHNOLOGY

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ABSTRACT

This study was carried out to ascertain the effectiveness of adopting sun-drying as an appropriate technology for the production of sun-dried fish. Field survey, processing operation and laboratory analyses were the research methods used. The field survey consisted of oral interviews and personal observations. The processing operation similar to the local processing technique but with some modifications. Laboratory analyses were carried out on both the locally processed and the "modified" processed fish. The analysis includes moisture content, microbial load, protein and fat contents, sensory evaluation and Thiobarbituric acid values. The personal observation from field survey showed that little or no regards is given to the hygiene of the fish during processing and this resulted in the poor quality of the fish product. Low moisture content of between 4.5 – 6% was attained for the fish products within four days of drying, while 15%, 15.9% and 15.86% were obtained for the market samples. Washing, scaling, gutting and salting were observed to affect the microbial load of the fish samples. The microbial load (cfu) of 1.3×10^5 , 5×10^4 and 1.2×10^5 were observed for the market samples, while 1×10^3 , 3×10^3 and 9×10^3 was obtained for modified processed samples. Thiobarbituric acid value of A528nm gave 1.482, 1.76 and 0.936 for market samples, while 0.70, 0.78 and 0.858 were obtained for modified processed samples. Sensory evaluation using Hedonic rating on a 7 point scale, the values of 4.17, 3.11 and 2.11 were obtained for market samples and 6.61, 5.61 and 5.28 for modified processed sample.

INTRODUCTION

Fish is a major source of protein and its harvesting, handling, processing and distribution provide livelihood for millions of people as well as providing foreign exchange earning to many countries (Al-Jufaili and Opara, 2006). Appropriate processing of fish enables maximal use of raw material and production of value-added products which is obviously the basis of processing profitability. Akinneye *et al.*, (2007) and Davies (2005) reported that the development of appropriate fishing machinery and techniques that employed effective production, handling, harvesting, processing and storage, cannot be over-emphasized especially in the age when aquacultural development is fastly gathering momentum in Nigeria. Opara and Al Jufaili (2006) reported high incidence of fish losses as a major impediment to the realization of government goal towards increasing the contribution of the sector to the overall national economy. The use of appropriate technology which is a radical approach to stem up production and processing technique, has become subordinate to social need, and is of paramount importance.

Akinola *et al.* (2006) reported different types of preservation methods; drying, smoking, freezing, chilling and brining in Niger Delta. They also reported that despite the rudimentary nature of process of traditional

methods, lack of control over the drying rate, sometimes results to under-drying or over-drying, and expose the fish to unexpected winds, dust, dirt, insect infestation, and contaminants such as flies.

The much talked about transfer of technology from the developed world to the third world has some significant consequences. These include amongst others, employment of skilled personnel along with the technology to provide guidance and extension services. This becomes capital intensive, often beyond the country resources. This brought about the idea of appropriate technology.

Appropriate technology is the technology that is affordable and still meets the needs of a people by striking a balance between local and modern technology.

The technology used in preservation of fish is highly determined by the resources available in a particular area. Osuji (1975) reported that in areas like Adamawa State, where wood is relatively scarce but with a remarkable high ambient temperature, sun-drying is prevalent as a method of preservation. Meambe (1980) and Azeza (1976) reported that in areas like Adamawa State, much of the post harvest processing are carried out in fishing camps, where fish is processed in the open and are inadequately dried before packaging. This results to a processed fish product with a generally high moisture content and therefore,

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susceptible to a deterioration such as bacterio-fungal decay, rancidity, insect infestation; etc (Meambe 1980; Neiland, 1987).

Although Osuji (1975), Azeza (1976), Kordylas (1990), Ihekoronye and Ngoddy (1985) have reported on the processing of fish using sun-drying in lake Chad district of Nigerian fresh water system, this paper focuses on the processing of sun-drying fish in Yola North Local government area of Adamawa State. The adequacy of using sun-drying as a local method of processing fish will be evaluated and developed in this paper.

MATERIALS AND METHODS

Processed fish sun-dried and smoked-dried fish were obtained from fish handlers along lake Geriyo and Borongi. Fresh fish samples of good quality were obtained from fishermen in the landing sites at lake Geriyo. Laboratory analyses were carried out in the Food Science Laboratories of Federal University of Technology, Yola and Federal Polytechnic Mubi. Oral interviews were conducted with fish handlers at Lake Geriyo, Borongi (along Benue River) and households. In each case, three respondents were interviewed. The interview was conducted to investigate the traditional handling and processing of sun-dried fish and the problems encountered in the process. Personal observations were also made.

In processing of sun-dried fish, the fresh samples were sorted, gutted and washed; the scales of some were removed and salted, while some were salted without scaling. The brining was done at 10% salt content, then sun-dried for four days to a moisture content of about 5%. The gutting and scaling were performed with a kitchen knife and the drying was done on a mat. An average of eight hours of sun drying was done for four days after which the sun-dried fish product was subjected to laboratory analyses and sensory evaluation, along with the locally sun-dried and smoked dried fish.

In sensory evaluation, two methods, the Hedonic and ranking tests were used, according to Rangana (1986). In the laboratory analyses, the moisture content, protein content and fat content were determined using standard procedures of AOAC (2005). Pour plate method was used to determine the microbial load and Thiobarbituric acid value for all samples were determined to evaluate rancidity.

The effects of the parameters below were investigated so as to get the "right" method of sun-drying fish.

- The effect of scaling and salting on the microbial load
- The effect of the intensity of sun on the quality of sun-dried fish
- The effect of moisture content on the shelf-life of the sun-dried fish
- The effect of sun-drying fresh fish on the product quality.

RESULTS AND DISCUSSION

Based on oral interview conducted and personal observations at Borongi (along River Benue), lake Geriyo and households where sun-drying and smoke-

drying of fish were done for commercial purpose, it was found out that species like *Tilapia*, *Clarias*, *Alestes*, *Synodontis* and *Lates niloticus* were common. Sun-drying is mainly carried out on three species, namely: *Tilapia spp.*, *Clarias spp.* and *Alestes spp.* This is because of their abundance at a particular period of the year.

The sun-drying is mainly carried out on the excess fish and which may have lost their acceptability because of spoilage. The big species like *Tilapia* and *Clarias* are splitted and salted before sun-drying for three days, after which they are smoked for about 40 minutes to dry. The sun-dried fish are then packaged in a basket or a paper carton and kept in a warm place like the kitchen so as to prevent re-absorption of moisture. .

The most common problems encountered during drying are the contamination of the fish by dust and spoilage due to low intensity of sunshine. This makes the drying to take a longer time. Efforts made to eliminate these problems include drying in an open roof room or elevated platforms, which reduces contamination. It was observed that nothing is done to eradicate the rancid nature of the fish oil. This may be due to acceptance by the consumers of the sun-dried fish as it is. The results of the analysis of moisture content (MC), fat content (FC), Microbial Load (MCI), Thiobarbituric acid value (TBA), Sensory evaluation (SE) and Protein content (PRT) are shown in Table 1. Results of the ranking test, show that sample D and C are significantly different ($P < 0.05$) in flavour and smell. Sample C is a traditionally sun dried fish while sample D is laboratory processed. The flavour/smell of samples D and E are significantly superior to others ($P < 0.05$). This could be due to the controlled processing in the laboratory. Further test show that there is no significant difference in flavour and smell of samples A and F. Sample A is a traditionally sun-dried while sample F is laboratory processed, but the processing did not include salting and scaling. Samples B and C are significantly inferior to the other samples with respect to flavour/smell ($P < 0.05$). Both samples were traditionally sun-dried.

The oral interviews carried out showed that washing, gutting, scaling and brining of fish before sun-drying is not usually done. This may affect the quality and the microbial load of the sun-dried fish. It has been observed from the results that the quality of the laboratory sun-dried fish was higher than others. Most of the sun-drying for four consecutive, days instead of three days or less as observed on the field could have partly contributed to this.

Ihekoronye and Ngoddy (1985) stated that sun-drying of fish in the lake Chad area is known to attain a moisture content of between 14 – 30% which is evident as for the moisture content of the traditionally sun-dried fish. Davies and Davies (2009) found that sun drying was the least traditional method practiced in Bayelsa state being a coastal state with high precipitation. This makes the sun-dried fish product have a short shelf-life and therefore, cannot be stored for as long as one year. But this study has shown that under a good drying condition, a low moisture content of about 5% can be attained. Also good storage practice such as packaging in a polythene bag, so that the sun-dried fish product does not pick up moisture is important. Keshavarie (1964) reported that a well dried fish can store for up to a year and above. This is because the environment for

action of micro-organism and enzyme has been eradicated.

CONCLUSION

It can therefore be concluded that a high quality sun-dried fish can be produced using sun-drying by adopting the technique of scaling, gutting, washing and

salting before sun-drying. Using this modified technique as proposed by our work, rather than sophisticated machinery which is out of the reach of the rural fish processor for the processing of sun-dried product can therefore assist in greatly reducing post harvest losses of harvested fish and consequently help in increasing fish (protein) consumption by people in Yola North Local Government Area and beyond.

Table 1: Moisture, fats, protein, Microbial load, thiobarbituric acid and sensory evaluation

Sample	MC (%)	FC (%)	PRT (%)	CFU MCL	TBA (528)	Hedomic S.E	Ranking S.E
A	15	13.88	6.3	1.3×10^5	1.482	4.17	66
B	15.9	12.03	6.65	5×10^4	1.716	3.11	90
C	15.86	10.13	6.04	12×10^5	0.936	2.11	99
D	6	12.01	7.46	1×10^3	0.70	6.61	25
E	4.1	11.89	7.08	3×10^3	0.78	5.61	47
F	4.48	11.79	6.99	9×10^3	0.858	5.28	57
Fresh	-	16.01	16.67	1×10^6	-	-	-

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