



Nutritional Quality of Sundried and Smoke-dried Catfish Sold in Custom Market, Maiduguri, Borno State

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Abstract Processed sundried and smoke dried catfish were obtained from custom market, Maiduguri, Borno State. A total of 100 fish samples (*Clarias gariepinus*) were purchased. 50 fish samples were sundried while the remaining 50 samples were smoke dried. Two weeks later, twenty-five each of the sundried and smoke dried were re-sundried and re-smoked dried respectively. Both samples were subjected to nutritional proximate analysis. Proximate content of the re-sundried samples were found to be lower than those of sundried, smoked and re-smoked dried respectively. It was concluded that processing method is a critical factor in proximate quality of fish products.

Keywords Nutritional quality, catfish, proximate, analysis

Introduction

Borno State in the north-eastern part of Nigeria is naturally endowed with abundant supply of Fish product due to its ecology and presence of large bodies of water such as Lake Chad, lake Alo and river Yobe [1]. Fish is a highly portentous food consumed by the populace. It is one of the most important source of animal protein and has accepted as a good source of proteins and other elements for the maintenance of healthy body [2]. A larger percentage of consumers do eat fish because of its availability. Flavours, palatability while fewer percentages do so because of nutritional value [3]. Consumption of fish provides an important nutrient to a large number of people world-wide. Fish has edge over meat because it is cheaper and relatively more abundant [3]. Most part of Borno state prefers sundried and smoke died Fish products due to their long shelf lives [4]. In the lake chad district, processed fish are packaged in perforated cartons and stocked temporarily in house until wholesales arrive to evacuate them [1] fishes normally spoil within 12-20 hours depending on the species and the method of capture. If the fishes are not processed immediately after they are captured, certain irreversible spoilage and deterioration reaction begins to take place [5]. Spoilage of fish not only results in a loss of protein for human consumption, but may also lead to great economic loss due to food borne illness [6]. Most of the processing or preservation operations are intended to reduce the rate of spoilage by reducing water activity of the Fish [7]. Each year a considerable amount of fish is lost due to spoilage. According to Eyo [8] during post harvesting of fishes approximately 1 out of 14 Kg of fish are spoiled and discarded due to improper handling.

Drying reduce or completely eliminates physiological microbial and enzymatic degradation of biological material such as Fish [9]. Dried fish provide protein compares favourably with eggs, meat and milk in its amino acid content and has a higher level of essentials lysine and methionine both of which are leading in a cereal-based diet [7]. Fish fat is characteristically high in poly-unsaturated fatty acid so that it provides diet low in cholesterol. The oil contains reasonably high quantities of fat soluble vitamins, especially vitamins A and D [10]. Dried fish products have their oil content and moisture content considerably reduced and contains more protein on weight for weight basis [11]. The objective of this study was to compare the nutritional qualities of sundried and smoke dried *Clarias gariepinus* sold in custom market, Maiduguri, Borno state.



Materials and Methods

Sample Collection

One hundred (100) samples of fresh *Clarias gariepinus* were purchased from custom market in Maiduguri, Borno, state. They were thoroughly washed and coiled/bent into Tonkoso. Fifty samples were sundried while other fifty were hot smoked. After two weeks, twenty-five of the sundried samples were re-sundried while twenty-five of the smoke dried samples were also re-smoke dried respectively. Each sample were packed in duplicates in carton and stored at room temperature for fifteen days and were used for the experiment.

Experimental Design

There were twenty-five different samples of *Clarias gariepinus*, each sample were replicated twice and then packed in cartoons. Each carton is made up of fifteen medium size of *Clarias gariepinus*. The weight of the processed fish sample were measured using a mettler AE100 loading balance and were later splitted open using a small hand held hacksaw. Later, 50 grams of each sample were measured and grinded separately in a manual grinder. The grinded portion was then used for proximate analysis.

Proximate Analysis

Protein, fat and oil, ash, moisture content and pH were determined according to the method of analysis of the association of analytical chemistry [12].

Protein Analysis

One gram of the grinded fish sample was introduced into a digestion tube. 20ml of concentrated sulphuric acid (H_2SO_4) and one digestion tablet (Kjeldahl tablet) were added. The tube was then put on the digester and allowed to digest for 3 hours when the mixture turned colourless and it was allowed to cool. The same treatment was given to the other samples. Later, 80ml of distilled water was added and the samples were transferred to a clean containers and labelled appropriately. 5 ml of each sample was then put into 100ml conical flask and into this were added 20 ml of 40% sodium hydroxide (NaOH) 5ml of each sample was then put into 100ml conical flask and into this were added 20 ml of 40% of sodium hydroxide (NaOH). 5ml of 4% boric acid and 3 drops each of bromo cresol green and methyl red indicators. This was then put under the receivers and the liquid ammonia was collected. After distillation, the samples were titrated using 0.01 NH_4Cl until a colourless liquid was obtained. The experiment was done in duplicate and the results were determined using 6.25 as the protein factor for fish.

$$A/B \times C/5 \times C/E \times 100/1000 \times 6.25$$

Fat/Oil Analysis

Two grams of the grinded sample were put in a thumble inserted into on extractor and a soxhlet excretion unit using petroleum Esther as the solvent and allowed to run for 3 hours. The oil extracted was dried and weighed. Each extraction was done in duplicate and the percentage of fat and oil was determined using the standard formula: %fat/oil = $Z-Y/Y \times 100/1$

Ash Content

Two grams of the grinded fish samples were introduced into empty crucible of a known weight in duplicates. The crucibles were then placed on a muffle furnace at about 560 °C and the sample was heated for about 3 hours until the sample burnt into ashes. The muffle furnace was then allowed to cool and the samples were transferred to a desiccator for cooling. This treatment was also given to the other samples, and finally the weight of the crucibles after ashing was taken. Thus, the percentage ash content was obtained using the standard formula: % Ash = $Z-Y/Y \times 100/1$

Moisture Content

Two grams of each grinded fish samples were dried in duplicate in an oven already set at 105°C temperature for about 6-8 hours to a constant weight and the moisture content was determined.



pH

Five grams of each fish sample were blended in 20ml sterile distilled water and the pH was determined using a pH meter. Smoked and re-smoke dried were classified as smoked process while sundried and re-sundried was also classified as sundried process.

Statistical Analysis

Data collected were analysed with one way analysis of variance (ANOVA) procedure using statistical product for services solution (SPSS version 16.0) for window. Statistical significant of difference between means were tested with Turkey HSD test at $P \geq 0.05$.

Results and Discussion

There were differences in the mean nutritional analysis of sundried and smoke dried as presented in the table 1 and 2 respectively.

Table 1: Mean percentage of protein, fat/oil moisture content, Ash and pH of the sundried fish samples

Sample	Protein content	Fat/oil	Moisture content	pH	Ash Content
SD	32.0±0.009 ^a	9.75± 0.019	3.25± 0.05 ^a	4.9±0.03 ^a	1.95±0.06 ^a
RSD	17.0 ± 0.0 ^b	6.0 ± 0.06 ^C	2.75 ±0.09 ^d	5.8 ± 0.12 ^b	1.80±0.15 ^a

Mean percentage with the same superscript along the row have no significance different at $P > 0.05$.

SD = sundried

RSD = Re-sundried

Table 2: Mean percentage of protein, fat and oil, moisture content, Ash and pH of the smoke dried fish samples

Sample	Protein content	Fat/oil	Moisture content	pH	Ash Content
SM	15.05±0.02 ^a	7.0± 0.15 ^a	6.25 ± 0.00 ^a	6.6±0.13 ^a	1.9±0.00 ^a
RSM	12.3 ± 0.13 ^b	9.5 ± 0.09 ^b	4.25 ±0.11 ^b	6.4 ± 0.03 ^a	2.4±0.17 ^a

Mean percentage with the same superscript along the row have no significance different at $P > 0.05$

SM = smoke dried

RSM = Re-smoke dried

The mean percentage of crude protein (32.0) of sundried fish samples are generally higher than that of re-sundried (17.0) fish samples. This might be due to the reprocessing of sun drying involved. The protein content of the sundried was also higher than that of the smoke dried sample which might also be due to the different in the processing methods. The fat content of the sundried was also higher than that of the re-sundried fish samples. This can also be attributed to the effect of reprocessing. The fat content of the sundried (9.75) was also higher than that of smoke dried (7.0) but almost the same with the re-smoke dried (9.5) this can also be attributed to the processing methods. The moisture content of the sundried (3.25) is also higher than that of the re-sundried (2.75) but less than that of smoke dried (6.25) and re-smoke dried samples (4.25) respectively. This can also be attributed to the processing methods. The lowest moisture content of the re-sundried might also suggest that it was more resistant to the enzymatic activities [3]. The ash content of both sundried and re-sundried shows no significance difference even when compared with smoke dried (1.9) and re-smoke dried samples (2.4) respectively. This suggests that processing might not have significant effect on the ash content. The pH content of the sundried (4.9) is less than that of the re-sundried samples (5.8) and was also lower than that of smoke dried samples (6.6) and re-smoke dried sample (6.4) respectively. This shows that processing and re-processing methods have no effect on the pH content.

Conclusion

The study shows that processing method is a critical factor influencing the proximate quality of fish products. The study also revealed that re-sundried fish samples have greater crude protein nutrient value.

Recommendation

Recommendation are made to:



- Evaluate the effect of a combination of different smoking temperature and time on the quality of fish products.

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