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Effect of salting on the nutritive value of *Clarias lazera* (Cuvier and Valenciennes)

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Abstract:

This research was directed towards the study of fish salting and its effect on the nutritive value of fish products. One of the popular fish species Clarias lazera (Garmout) was selected for this study. Fresh fish samples were taken from Al Mawrada fish market. The proximate composition of the fresh and salted samples of Clarias lazera was determined, including the determination of moisture %, ash %, oil % and protein % was carried out. In addition to that some minerals and microbiological parameters were used to compare the effect of salting on the nutritive value of Clarias lazera. The moisture content was 70.754 % and 23.138 %; Ash content was 9.998 % and 17.853 %; Protein content was found to be 72.345 % and 66.825 % and Oil content was 13.165 % and 15.987 % for control and salted fish samples respectively. From the statistical analysis significant differences were

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found in moisture, ash and protein contents (P<0.05) of fresh and salted Clarias lazera., and no significant difference was found in oil content (P>0.05). Also there were significant differences between fresh and salted fish in sodium and iron contents (P<0.05), and no significant differences were found in calcium and potassium contents (P>0.05). Microbiological examination results showed that the fresh and salted products of Clarias lazera are within the recommended microbiological limits for fish and fishery products.

Key words: *Clarias lazera*, salting, nutritive value, preservation.

1- INTRODUCTION:

Fish is one of the most important sources of animal protein available in the tropics and has been widely accepted as a good source of protein and other elements for the maintenance of healthy body (Karrar, 2007). The global contribution of fish as a source of protein is high, ranging from 10 % to 15% of the human food across the world (Wilson, , 2007). Fish and fishery products are highly nutritious. In addition to the high percentages of animal protein, they provide several other nutrients such as vitamins A and B especially in the liver, and E and K vitamins, as well they are good sources of some minerals like calcium, phosphorus and iron (Lunven, 1982).

Fish is an extremely perishable food item (Agbo et al., 2002), more than cattle, sheep, and poultry, and get spoiled very easily even in temperate climates. Fish is known for its short shelf-life capabilities, because it has been shown to have higher percentages of microorganisms than other types of animal proteins, which can cause faster deterioration and spoilage (Adesiyun 1993). Spoilage affects the odor, flavor, texture, color and chemical composition of fish (Agbabiaka *et al*., 2012) and these in turn affect the nutritional quality, consumer acceptability and commercial value of fish (Daramola

et al., 2007), therefore it must be preserved in one way or another, unless it is consumed quickly after being captured.

Preservation of fish in developing countries is generally done by traditional methods i.e., salting, drying and smoking. Salting process is considered as one of the oldest methods of fish preservation and this process is still been used in several places around the world. The effect of salt is to obstruct or destroy the growth of the microorganism (Bahri *et al*., 2006). Salted fish products are popular in many countries around the globe as these have been proven to be safe for consumers (Turan *et al*., 2007).

Clarias lazera which is selected for this study is the most important dietary fish in Sudan; it is amongst the top twenty species of the inland water resources of the Sudan they are found in abundance all the year round. They are consumed as fresh or treated products (Karrar, 1997).

The main objective of this work is to study the effect of salting on the nutritive value of salted *Clarias lazera* product and to contribute in the development of fish processing to reduce post harvest losses.

2- MATERIALS AND METHODS:

2-1-Sample preparation:

Fresh fish specimens of *Clarias lazera* were obtained for this study from Omdurman fish market (Al Mowrada). Fish specimens were washed with tap water, gutted, eviscerated and washed again. Then the fish sample was divided into two parts. One was taken and analyzed as a control fresh sample. The second one was salted using 20% sodium chloride of the fish weight.

2-2-Proximate analysis:

2-2-1-Moisture content:

The moisture content was calculated by determining the difference in weight before and after drying one gram of the sample in a drying oven adjusted at 100 – 105 C°, as described by AOAC (2000). Then the moisture content was calculated using the following formula:

$$\text{Moisture \%} = \frac{\text{Wet weight} - \text{dry weight}}{\text{Wet weight}} \times 100$$

2-2-2-Protein content:

Protein content was determined by the Micro – Kjeldahl method, and applying the factor 6.25 to the nitrogen content of the sample, as described by AOAC (2000). The protein percentage was given by the following formula:

$$\text{Protein \%} = \frac{(V_2 - V_1) \times N \times 14 \times 100}{1000 \times \text{Wt.}} \times 6.25$$

Where:

V_1 = Volume of HCl used in titration.

V_2 = Volume of HCl used in blank titration.

N = Normality of HCL used in titration.

14/1000 = Conversion ratio from ammonium sulphate to nitrogen.

Wt. = Weight of sample.

6.25 = Conversion factor from nitrogen to protein.

2-2-3- Oil content:

Fat content was determined by extracting 1 gm of sample with petroleum ether (boiling point 60 – 80 C°) for six hours in Soxhelt apparatus. The extract was then dried in an oven at 100 – 105 C° for removal of extra ether traces, following the

method described by AOAC (2000). The fat content was given by the following formula:

$$\text{Oil \%} = \frac{\text{Weight of ether extracted fat}}{\text{Weight of sample}} \times 100$$

2-2-4- Ash content:

Ash content was determined after incineration of 2 gm of sample in a Muffle furnace at 450 -550 C^{o} for 5 hours, as described by Pearson (1976) and AOAC (2000), the ash percentage was given by the following formula:

$$\text{Ash \%} = \frac{\text{Weight of ash}}{\text{Weigh of sample}} \times 100$$

2-2-5- Minerals content:

Minerals were determined by further analysis of ash following the method described by Koddebuch (1988).

2-3- Microbiological analysis:

Fresh and salted fish samples were analyzed for the determination of the total count of bacteria, detection and identification of total coliforms, *Escherichia coli* and *Salmonella spp*. Following the standard methods for analysis, described by (FAO, 1992).

2-4- Statistical analysis:

The data obtained throughout the course of this study was statistically analyzed using the computer package (SPSS). T-test with significant level (0.05) was used for the comparison of means.

3- RESULTS AND DISCUSSION:

Fish is a perishable food commodity; it requires preservation for future uses. Several preservation methods are followed over the world for preserving fish. Aims of all these methods are the same; to extend the shelf-life of fish so that the fish can be used in future properly (Adesiyun, 1993). Thus, certain processes such as salting and drying could be used to obtain a product which maintains almost all its nutritional characteristics with a longer shelf life. Salting process could be wet, dry or a combination of the two (Bellagha *et al*., 2007).

The nutritive value and the chemical composition of fish is an important aspect in fish processing as it influences both the keeping quality and the technological characteristics of the fish. It is directly related to the moisture, protein, fat and ash contents of the muscles (Huss, 1988). The initial quality of raw fish material strongly influences subsequent performance in processing and storage. Fish freshness and related quality control problems were studied by Jackson (1971) and Huss (1988).

A comparative study of fresh and salted *clarias lazera* (Garmout) meat composition was conducted to determine the effect of the salting on the nutritive value of fish.

Results concerning the proximate composition of fresh and salted *clarias lazera* are summarized in table (1). Table (2) shows the effect of salting on the minerals content of *Clarias lazera* .

From the results obtained, the moisture content was found to be 70.754 % and 23.138 % for fresh and salted fish samples respectively (figure 1). Ash content was 9.998 % and 17.853 % for control and salted fish samples respectively (figure 2). Protein content was found to be 72.345 % and 66.825 % for fresh and salted fish samples respectively (figure 3). Oil content was found to be 13.165 % and 15.987 % for fresh and salted fish

samples respectively (figure 4). These results coincide with the results reported for fish by Mahmoud (1977), Omer (1984), Awouda (1988) and Karrar (1997).

From the statistical analysis of data using T-test it was noticed that there were significant differences between fresh and salted fish in concerning moisture, ash and protein contents ($P<0.05$). On the other hand oil content was not significantly different between fresh and salted fish ($P>0.05$). The statistical analysis of data of minerals content showed significant differences between fresh and salted fish in concerning sodium and iron contents ($P<0.05$). No significant differences were noticed in case of calcium and potassium contents ($P>0.05$).

Table (1): Effect of salting on the proximate composition of *Clarias lazera*.

Parameters	Treatment		Sig.
	Control	20 % salted	
Moisture%	70.754 ± 1.469	23.138 ± 2.609	0.013
Ash %	9.998 ± 1.538	17.853 ± 2.845	0.024
Protein %	72.345 ± 2.679	66.825 ± 3.927	0.019
Oil %	3.165 ± 0.702	11.987 ± 2.078	0.227

Table (2): Effect of salting on the minerals content of *Clarias lazera*.

Parameters	Treatment		Sig.
	Control	20 % salted	
Na (mg\L)	92.75 ± 6.671	403.81 ± 12.504	0.000
K (mg\L)	76.57 ± 4.068	82.92 ± 7.180	0.172
Ca (mg\L)	123.48 ± 13.416	111.77 ± 8.332	0.254
Fe (mg\L)	0.712 ± 0.055	0.635 ± 0.024	0.071

Results showed reduction in moisture content of fish due to salting process. This is in accordance with the observations by Mujaffar and Sankat (2006), Sereno *et al.* (2006) and Kituu *et al.* (2008).

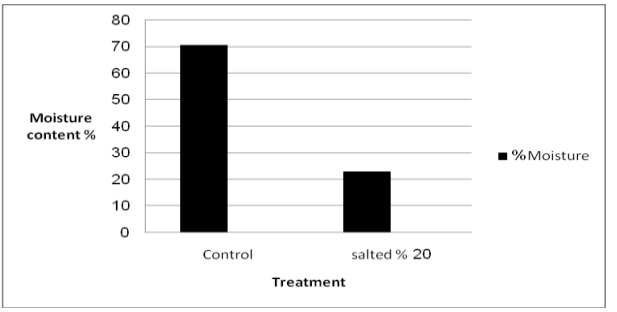

Figure (1): Effect of salting on moisture content of *Clarias lazera*

Ash content showed clear significant differences between the two treatments. Increased values in salted samples could be attributed to the salting process; these results were in accordance with (Ahmed, 2006 and Bakhiet and Khogalie, 2012).

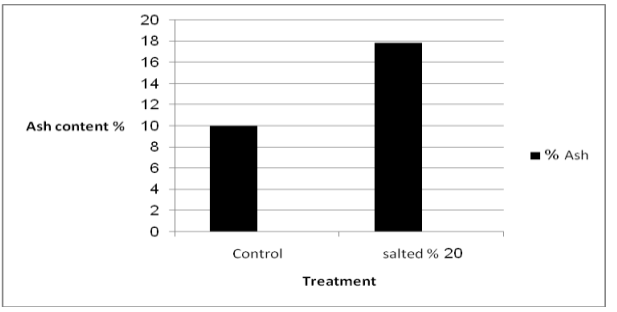

Figure (2): Effect of salting on ash content of *Clarias lazera*

Protein content was significantly different between the two treatments ($P<0.05$) as shown in figure (3). The reduction in protein level in salted products was recorded by Ufodike and Obureke (1989) and Arekemase *et al* (2012).

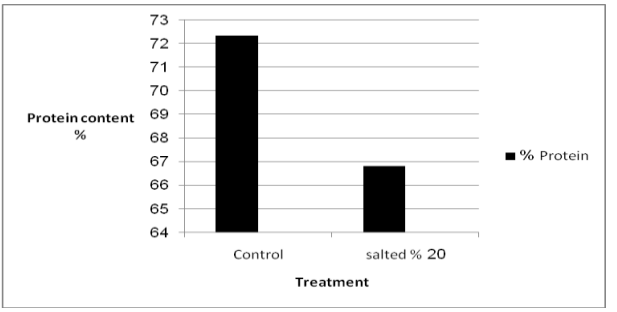

Figure (3): Effect of salting on protein content of *Clarias lazera*

Fat content was not affected by the different treatments (P>0.05) (figure 4). This is in agreement with Hughes *et al.* (1980) and Shearer (1994) who stated that lipid content of fish varies only with seasonal and physiological factors.

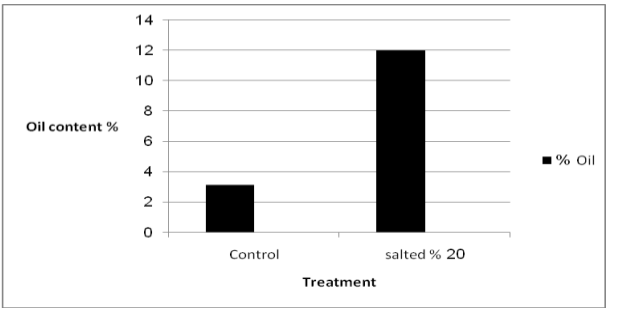

Figure (4): Effect of salting on oil content of *Clarias lazera*

The total count of bacteria of fresh and salted fish was determined, as well as the identification of Total Coliforms, *E. coli* and *Salmonella.* Results are shown in details in table (3).

Table (3): Total viable bacterial count and presence of some dominant microbial species in salted *Clarias lazera.*

Treatment	Total Bacterial count cfu /1 ml	Total Coliforms	*E. coli*	*Salmonella.*
Control	4.69 X 10 ^{3}	-ve	-ve	-ve
20 % salted	5.11 X 10 ^{3}	-ve	-ve	-ve

The results obtained indicated that the fresh and the salted products of the *Clarias lazera* are within the acceptable ranges of the specified microbiological limits recommended for fish and fishery products (Liston, 1980; Jay, 1992 and Yanar, *et al*, 2006).

4- CONCLUSIONS:

Conclusions can be summarized in the followings:

1. Salting is simple, effective, and cheap method for *Clarias lazera* fish preservation that can keep a suitable rang of nutritional value for the consumer.
2. Proximate chemical composition of the fresh fish was closer to the salted samples, where the fresh fish samples were higher than the salted samples.
3. Salting is a very useful and effective method in microbial growth prevention in preserved *Clarias lazera* products.

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