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Effect of Drying on Proximate and Microbial Analysis of Dried *Clarias* sp. and *Tilapia* sp. Collected from Gedaref Market, Gedaref state, Sudan

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ABSTRACT

Keywords

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This study curried out to determine the bacterial load and proximate chemical analysis of dried Garmut (*Clarias sp.*) and Bolti (*Tilapia sp.*) purchased from Gedaref market. There is highly significant difference in Moisture, Dry Matter, Ash, Ether Extract ($p \leq 0.01$) and significant difference in nitrogen free extract ($p \leq 0.05$) and no significant difference in Crude Protein. The bacterial count in dried *Clarias* is $2.9\times 10^5 \pm 2.4\times10^5$ while in dried Tilapia is $5.6\times 10^5 \pm 3.9\times10^5$. Also the study revealed that there is no significant difference in total bacterial count ($P < 0.05$) between *Clarias sp*. and *Tilapia sp*.

Introduction

On a global scale, fish and fish products are the most important source of protein and it is estimated that more than 30% of fish for human consumption comes from aquaculture. Capture fisheries and aquaculture supplied the world with about 142 million tons of fish in 2008. Of this, 115 million tons was used as human food (FAO 2010).

In the Sudan, nearly 70% of the total fish landings are consumed fresh; the rest is cured either by salting, fermentation or sun drying.

Some of the local fish supply is moked in Southern Sudan where smoked and very dry fermented fish products are very popular among the local community (FAO, 1992).

Tilapia is an economically important food fish that have the potential to outcompete native species in tropical environments across much of the South Eastern United States. They are the most successful aquaculture of fish because they are hardy and easy to grow, white-fleshed, mild flavored, and appeal to the palate of consumers. Also the world production from aquaculture of tilapia has reached 3.5 million tons (FAO, 2010).

The African catfish, *Clarias gariepinus* has been reared for almost 20 years in Africa with mixed success; the total farm production of this species being only 3. 978 metric tons or 7.4% of the total farmed fish production of 69. 434 mt in Africa in 1994. The most common habitats of these species are floodplain swamps and pools where the catfish can survive during the dry seasons due to their accessory air breathing organs (De Graaf and Janssen, 1996).

Fish is very important food stuff, especially in developing countries, due to its high protein content and nutritional value of unsaturated fatty matter. However fish is greatly perishable, quality losses might occur very rapidly after catch, especially in hot climates and tropical areas where cold preservation techniques are often missing. Traditional fish processing, such as salting/brining, drying, smoking, allow better preservation and storage and increase fish availability to the consumers.

The objectives of this study to provide baseline information on the chemical composition (proteins, lipids, moisture, ash) and microbial load of dried *clarias sp.* and *Tilapia sp*. collected from Gedaref market.

Materials and Methods

Sampling Methods

This study was conducted at Sudan University of Science and Technology, College of Veterinary Medicine and Animal Production, Department of Fisheries and Wildlife science.

Nine fish of Garmut (*Clarias sp.*) and Bolti (*Tilapia sp*.) samples were purchased from Gedarif Market, Gedarif State, Sudan, that dried under sun-open air. The proximate and microbial analysis were done for fish samples.

Approximate Chemical Composition

The proximate analysis of dried fish was carried out by methods of Association of Analytical Chemist (AOAC) (1984). Samples weighted at 105°C to determine moisture. Protein was determined by measuring nitrogen (N×6.25) using the Kjeldahl method. Fat was assayed by ether extraction using Soxhlet method. Crude ash was determined following combustion at 550 °C for 6h.

Bacteriological Methods

Test for Total Viable Count (TVC)

The test was done according to Quin *et al*., (2000). One gram from each sample was homogenized in sterile mortar and put in sterile tubes. Then Serial ten folded dilutions of the original samples were made and the dilutions were plated using the spread plate method. An inoculum of 0.1 ml of each dilution was placed on the surface of plate count agar. The inoculums was spread rabidly over the surface using glass rod. Incubated plates were left to dry at room temperature and then incubated for 24-48 hours at 37 C°. Twenty to three hundreds colonies were counted. Two plates were inoculated per dilution. The total colony count per milliliter was calculated by multiplication of the number of colonies counted by dilution level.

Statistical Analysis

For comparison between the means of biochemical constitutes (protein, moisture, fat and ash) and microbial count were analyzed by One-way ANOVA Procedures and SPSS version 14 as described by Gomez, 1984.

Results and Discussion

Table (1) showed the proximate chemical analysis of Garmut (*Clarias sp*.) and Bolti (*Tilapia sp*.). There is highly significant difference in Moisture, Dry Matter, Ash, Ether Extract ($p \leq 0.01$) and significant difference in Nitrogen Free Extract ($p \leq 0.05$) and no significant difference in Crude Protein. The result obtained also showed that the bacterial count of dried Clarias is $2.9\times 10^5 \pm 2.4\times10^5$ while in dried Tilapia is $5.6\times 10^5 \pm 3.9\times10^5$. Also the study revealed that there is no significant difference in total bacterial count ($P <0.05$) between *Clarias sp*. and *Tilapia sp.* as show in Table (2) .

The analysis of this piece of work was carried out on two main aspects: proximate chemical composition whose main aliments analyzed was: protein, fat, moisture, dry mater, NFE and ash.

This analysis indicated that Garmut (*Clarias sp*.) recording the higher values for protein, dry mater, fat, NFE and ash, at 61.3%,94.5%, 8%, 17.5%,7.9% and 5.6% respectively. While *Tilapia sp.* recording the higher values for moisture at 7.6%, and 61.04%, 92.5 %,7.5%,16.2%, and 7.4% for protein, dry matter, fat, NFE, and ash (Table (1)). The same result obtained by (Oladipo and Bankole, 2013) showed that dried *Clarias sp*. had higher protein and fat content than dried *Oreochromis niloticus*. This result in partial agreement with finding of Abulmunsur *et al.,* (2013) who curried study on market sample three sun-dried freshwater fish namely *Laoeo rohita*, *Channa striatus* and *Wallago attu* found that protein content ranged from 49.32 to 62.85 % ash content 11.11 to 18.89% and lipid content 4.92 to 11.0 % and Islam et al., 2013 found the protein content in the range of 23.02 to 41.38.% with highest value in *Channa punctatus*, lipid content ranged from 3.21 to 14.03% and ash content in the range of 20.14 to 14.03%. Babiker and Dirarr (1992) carried out studies on (Kejeik) fermented, dried fish of Sudan on three fish species; Dabs (*Labeo horrie*), Bolti (*Tilapia sp*.) and Gurmut (*Clarias sp*.). They mentioned that the moisture content were 9%, 7.1% and 7.7% for protein content were 65%, 58.1% and 55.1%, fat content were 11.3%, 18.2% and 17.6% and ash content were 18.5%, 22.9% and 12.6% respectively for Dabs, Bolti and Gurmut. Also Ikeme (1999) studied characterization of traditional Smoked dried fish in Nigeria. He found that the chemical composition showed that 60-80% protein, 6-15% fat, 7-19% moisture, and 5.4- 15% ash. The same results were recorded by Kofi (1992) who studied fermented fish in Africa and reported that the proximate chemical composition results were in the range of 18.4 – 71.9%, 12.6 – 64.9%, 1.4 – 4.1% and 1.3 – 22.5% for protein, moisture, fat and ash respectively. He found that the products with high moisture content tend to deteriorate faster than dried products especially if the salt level is low.

While these results were differed from the finding of Magawe (1991), Agab and Bashir (1988) and Ali *et al.,* (1996) who studied the meat quality and nutritional value of some common fresh Nile fishes of the Sudan.

The proximate chemical analysis had clearly explicated that the percentage moisture, dry mater, fat, and ash are highly significantly difference between the two species ($p < 0.01$) while there is no significant difference in crude protein and NFE percentage differed significantly ($p < 0.05$). This observation, in agreement with FAO (2005) and Islam *et al.,* 2013 reported that chemical composition of fish varies greatly from one species and from one individual to another.

Table.1 Shows Mean ± SD and Significant Level of *Clarias* and *Tilapia*

Parameter	Fish species	Mean ± SD	Level of sign
CP %	*Clarias*	61.29 ± 0.63	NS
	Tilapia	61.04 ± 0.66	
Moisture %	*Clarias*	5.59 ± 0.65	**
	Tilapia	7.63 ± 0.47	
DM %	*Clarias*	94.51 ± 0.55	**
	Tilapia	92.48 ± 0.54	
Ash %	*Clarias*	7.92 ± 0.25	**
	Tilapia	7.44 ± 0.15	
EE %	*Clarias*	7.96 ± 0.17	**
	Tilapia	7.53 ± 0.15	
NFE %	*Clarias*	17.46 ± 1.00	*
	Tilapia	16.17 ± 0.97	

**: Highly significant difference ($p \leq 0.01$).
*: significant difference ($p \leq 0.05$).
NS : No significant.
SD: Standard Deviation.

Table.2 The Total Bacterial Count for *Clarias* SP. and *Tilapia* sp. Samples

Treatment \ Parameter	Total count units cfu/g	
	Mean	± S.D
Clarias	5.6×10^5	$\pm 3.9\times10^5$
Tilapia	2.9×10^5	$\pm 2.4\times10^5$
Significant	NS	

NS = No significant.
(cfu/g) colony forming units per gram.

The total number of bacterial count for dried (*Clarias sp.*) and dried *Tilapia sp* was 5.6 $x10^5 \pm 3.9$ $x10^5$ and 2. 9 $\times10^5 \pm 2.4$ $x10^5$ respectively as shown in (Table 2) . This number is within the accepted limit mentioned by SSMO (Sudanese Standards and Metrology Organization) and this result agree with Ahmed and Eltegani (2012) who reported that the total number of bacterial count for dried (*Clarias sp.*) was 5.6 $x10^5 \pm$ 3.9 $x10^5$. Also Geatha *et al.*, 2014 found the same result of sun dried fish (*Trichiurus leptus*) ranged from $1.1x10^4$ to $2.5x10^5$ and disagree with Oladipo and Bankole (2013) showed that dried *Clarias sp.* had lowest bacterial count 2.0 $x10^4$ and Babiker *et al.*, (2014) recorded that the total bacterial count of dried bayad about 2.16x 10^6 cfu/g. Also Islam *et al.*, 2013 found that the range of aerobic count of dried fish $2.3x10^5$ -$3.6x10^7$. Liston (1980) reported a range of 10^2-10^7 cfu/g for the fish meat. Also this result agree with the finding of Hoffman (1971) who reported the range of numbers of microorganisms are found on all outer surfaces. The bacterial load of dried fish decreased and this due to remove of water level below that needed for microbial growth and enzymes activity (Doe *et al.*, 1983).

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