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Research Paper

Effect of different freezing periods on the chemical composition of the fish Nile Tilapia (*Oreochromus niloticus*)

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The study was designed to investigate the effect of frozen storage period on the chemical composition of Nile tilapia fish (*Oreochromis niloticus*). The samples were bought from Elmawrada fish market and were subjected to thirty days of frozen storage periods and analyzed at intervals of (0, 15, 30,) days. Protein decreases with increasing duration of frozen storage with the fresh samples having the highest protein content 33.88% while the least 23.26% was recorded for fish samples that were frozen for thirty days. Similar results were obtained for the moisture content where the least content was 61.50% and the highest was 79.33% also the fat content changed from 7.75% to 6.10.

Key words: Freezing, tilapia, chemical composition

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 (Andrew, 2001). Fish in the sudan have been a major source of protein and energy for many communities, especially among the nilotic tribes of the south and some of the Nubian ethnic groups of the north (Jackson, 1923). The less developed countries capture 50% of the world harvest and a large proportion of the catch are consumed internally (FAO, 1985). Fish is a highly perishable commodity recording considerable losses in quantity before consumption (Ghaly *et al*., 2010). Freezing is currently one of the most widespread methods of conserving fish, on both the industrial and domestic levels. During the freezing process and frozen storage, fish muscle can undergo a number of changes, such as denaturation and aggregation of the myofibrillar proteins. This result in alteration of the functional properties of muscle proteins, loss of o directly result in economic losses (Barroso *et al*., 1998).

Freezing and frozen storage of fish can give a storage life of more than one year, if properly carried out, and allowed the stock piling of fish during periods of good fishing and high catching rates as well as widened the market for fish products of high quality (Johnston *et al.,* 1994). The main objective of this study was to determine the effect of freezing on the chemical composition of the Nile Tilapia (*Oreochromus niloticus*) collected from wild environment.

MATERIALS AND METHODS

Sample collection

Fresh samples were collected from EL Mawrada fish market. *Tilapia* species A total of (9) samples each about 100-110 g stored in ice container and transferred to the Fisheries Laboratory in Sudan University Department of Fisheries and Wildlife Science for preparation and processing, Random samples were taken to conduct the chemical analysis of fresh fish**.**

Proximate composition analysis

Moisture content, crude protein, fat and ash were determined for wet sample according to standard methods of Association of Official Analytical Chemists (AOAC) (1985) as follows:

Moisture content determination

The samples were first weight (Initial weight) then dried in an electric oven at 105°C for 24-30 h to obtain a constant weight. The moisture content was calculated as follows:

$$\text{Moisture content (\%)} = \frac{\text{Initial weight} - \text{Dry weight} \times 100}{\text{Initial weight}}$$

Crude protein determination

The Kjeldal method for estimation of nitrogen was applied. Nitrogen content was converted to protein percentage by multiplying by 6.25 as follows:

$$\text{Protein \%} = \frac{(Va - Vb) \times N \times 14 \times 6.25}{1000 \times Wt} \times 100$$

Where Va = volume of HCL used in titration
Vb = volume of sodium hydroxide of known normality used in back titration
14 = conversion factor of ammonium sulfate to nitrogen
6.25= conversion factor of nitrogen to protein
Wt= weight of sample
N= normality of NaoH

Crude fat determination

Fat content of each sample was determined according to Soxhlet method by ether extract using 2 gm of fish samples. Extraction continued for 5 hours at 100°C before finding the weight of the extract fat. Fat percentage was then calculated as follows:

$$\text{Fat \%} = \frac{\text{Extracted fat weight} \times 100}{\text{Sample weight}}$$

Ash content determination

Ash was determined by heating 1 gm at 550°C in muffle furnace until a constant weight was obtained. Ash content percentage was given by the following formula:

$$\text{Ash \%} = \frac{\text{Ash weight} \times 100}{\text{Sample weight}}$$

pH measurement

One gram of homogenized Fresh and freezing from each sample was added to 10 ml of distilled water into a test tube. The pH level was determined using pH meter instrument model JENNAY 3015.

Statistical analysis

Results were analyzed using the SPSS computer program, (ANOVA).

RESULTS

Table 1 shows the proximate analysis of both fresh and frozen fish with different freezing periods (15 and 30 days) the results indicate significant difference in moisture, protein, fat, ash and pH values between fresh and frozen fish.

Table 1. The chemical composition components of Nile Tilapia *Oreochromus niloticus.* Subjected to different Freezing periods (Mean±SD).

Freezing period	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	PH
0	79.33±2.77	33.88±787	7.75±0.151	4.75±0.18	6.05
15	72.7±2.15	27.3±0.53	6.63±0.15	4.35±0.187	5.0
30	61.50±1.03	23.26±0.75	6.10±0.126	3.88±0.147	4.4
Significance	**	**	**	**	**

**: significant at (P<0.01).

DISCUSSION

The chemical composition of fish is an important aspect in fish processing as 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 muscle (Huss, 19**95**). These parameters were taken in consideration during the comparative study of nutritive value of fresh and frozen fish products. The data presented in (Table 1) shows the proximate composition of fresh and frozen fish with different freezing periods.

Moisture

In Table 1 the moisture content of raw fish in fresh basis was 79.3%, while for frozen fish at different storage time(15 and 30 days) was 72.7%,61.5% respectively. The fresh fish moisture content was higher than (Remijo, 1992) who found that the moisture content of fresh *Labeo spp* fish was (70.4-71.2%), and lower than (Ahmed, 2006) who found that the moisture content of fresh fassiekh fish species is (81.9-72.9).Freezing decreased significantly at ($P<0.01$).

Crude protein

With regard to the data shown in (Table 1), the protein content was 33.8% in fresh fish, while for frozen fish at different storage time (15 and 30 day) was 27.33% and 23.2% respectively. This result was higher than the findings of (Clucas and Ward, 1996) who reported that flesh from healthy fish contained (15-24%) protein.

Fat content

As illustrated in (Table 1) it is clear that fat content of fresh fish was 7.7% while for frozen fish at different storage time (15 and 30 day) was 6.6%,6.1%respectively, the result of fat content in fresh fish is higher than that presented by (Ahmed, 2006) who found that the fat content was (1.4-2.2%) and (1.62-0.88%) for fresh fish and fassiekh fish respectively. There was significant difference in fat content among different Freezing periods.

Ash contents

The ash of fresh fish was (4.7%) while for frozen fish at different storage time 15 and 30 day) was 4.3%, 3.8% respectively. The ash content of fresh and frozen fish is higher than finding of (Ahmed, 2006) who reported that the ash contents was (1.1%-1.7%) on fresh *Hydrocynus spp*. Also there was significant difference at ($P<0.01$) in ash content among different Freezing periods.

pH values

The highest pH was found for fresh fish is (6.05), while the frozen fish at different storage time (15 and 30 day) was had the lowers pH value is (5.0, 4.4) respectively the decreasing of ph values could be associated with the production of basic components induced by the growth of bacteria. The PH changes are in agreement with the finding of and (Ryder *et al.,* 1993). This affect significantly at ($P<0.01$) in the pH value.

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