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The Effect of Magnetized Water on the Proximate Composition of Nile Tilapia (*Oreochromis niloticus*)

Samia G. mahmoud, Elnasri M. Mutwali, HassanO. Ali*

ALZAIEM ALazhari University

***Corresponding Author:** Hassan O.Ali, ALzaiem ALazhari University.*

ABSTRACT

Study of the effect of magnetized water on the proximate composition of Nile tilapia (Oreochromis niloticus) was conducted at Faculty of Education, Al Zaiem Al Azhari University, Sudan, using standard procedures. The protein and ash content percentage were higher in treatments using magnetized water in the two years experiments. Significant difference was detected in total weight and fated length of tilapia used magnetized water.

INTRODUCTION

Fish are excellent sources of protein when compared with other sources of protein due to the amino acid composition and protein digestibility (Louka, *et al.*, 2004). They also serve as a favourite foodstuff for large number of people across the globe due to its several health benefits (Ali and Kumar, 2010). Fish is one of the cheapest and direct sources of protein and micro-nutrients for millions of people in Africa (Ben and Heck, 2005). The proximate composition of fish varies greatly and the variation could be due to age, feed intake, sex and sexual changes connected with spawning, the environment and season (Silva and Chamut, 2000). The knowledge of fish composition is essential for its maximum utilization. The aim of this study is to determine the proximate composition of Nile tilapia reared in magnetized water.

MATERIAL AND METHODS

Sample Collection

The Nile tilapia samples used for this study were obtained from Elshagara Fisheries Research Centre (Elshagara, Khartoum).

Preparation of Fish Sample

Morphometric measurements of total weight and total length were conducted. Each fish samples were cleaned and oven dried at a temperature 40-60^{o}C. The muscles of the dried samples were prepared into powdered form and labeled for the proximate composition analysis.

ANALYSIS OF PROXIMATE COMPOSITION

Determination of Crude Protein Content

Kejeldah method was used to determine the total nitrogen control and then the crude protein by multiplying with a factor 6.25. The sample was digested in H_2So_4 using $CuSo_4$ as a catalyst and 20ml of concentration H_2So_4 was carefully added. The flask was gently heated on a Gerhardt heating mantle in an inclined position is a fume cupboard until full digestion was achieved. The contents of the flask were then transferred to a clean 100ml volumetric flask, and 25ml aliquot was used for the distillation and total nitrogen was determined calorimetrically.

Determination of Ash Content

Ash content of fish samples was determined by incineration in a carbolated Sheffield LMF3 muffle furnace at 5.00d^{o}C (AOAD), 1988). The difference in weight of the fish samples before and after heating was taken as the ash content, the formula is as follows:

$$\%\,\text{Ash content} = \frac{W2 - W0}{W1 - W0} \times 100$$

Where: W0 = Empty crucible

W1 = Dry sample; and N2 = Ash sample

Determination of Fat Content

The apparatus used was soxhelt extraction apparatus. Clean numbered flasks were placed in an oven at 135^{o}C for two hours. The flasks were cooled in a Desiccators and the weight (x) was recorded. A sample of 2g was placed in role filter paper and then was placed in the extractor. About

150ml diethyl ether was added into the flask and was placed on the heating system while connecting to the extractor and condensers. The condenser was covered with cotton wool and temperature of water was at 70°C. The extraction was for 16 hours; the flask was removed and was covered with cheese cloth and left overnight. The flask was placed in an oven set at 135°C for two hours then cooled in a Desiccators and the weight (Y) was record. The fat content % was calculated as:

(Y – X) × 100/wt of sample.

Determination of Dry Matter

A marked dishes were placed in an oven sat at 135°C for two hours, then cooled in a Desiccators and the weight (X) was recorded. About 2g of the sample was placed in the dishes and the weight of the dish + sample (Y) was recorded. The dishes with samples were placed in a oven set at 135°°C for two hours, then cooled in a Desiccators and the weight (Z) was recorded as follows:

The dry matter % calculated as:

-(Z – X) – (Y = X) X 100 / weight of sample.

Statistical Analysis

The data collected was tabulated and subjected to analysis of variance (ANOVA) using the help of SPSS 19.0 version.

Results And Discussion

The starting length of Nile tilapia was 10.5cm and after 15 days the length reached 11.0, 11.8 and 14.7 cm at treatments T_1, T_2 and T_3 in the first year experiment respectively.

A significant difference (P=0.05) was detected in both years.

The starting weight of Nile tilapia was 35.00g; however, after 15 days the weight reached 37.60g for the control, 40.23g for treatment T_2 and 40.20g for treatment T_3 in the first year experiment. In the second year experiment the weight of the tilapia was 37.33, 30.30 and 40.10 for treatments T_1 T_2 and T_3 respectively.

Alhassani and Amin (2012) found that a significant increase in weight gain was recorded in broiler chickens exposed to magnetic water in early age of the chickens. Lin and Yotrat (1988) found a high final weight in calves drinking magnetic water.

Table (2) showed the crude protein percentage of Nile tilapia which ranged from55.82 – 76.12% in the first year experiment. However, in the second year experiment the crude protein percentage ranged from 65.80 – 72.97, which were higher than the values obtained by Effiong and Fakunle (2011), and by Bolawa *et al*. (2011), 38.19%. The nutritional elements showed variable values in all samples analyzed, with crude protein recording the highest value and lipid recording the lowest. These results were in consistent with those reported by Mohamed *et al*. (2010) in some fish species in River Nile in Sudan.

Table1: *Morphometric measurement of Nile tilapia fish in the year 2015 and 2016.*

Year	Treatment	Total weight (g)	Total length (cm)
2015	T_1	37.76	11.0
	T_2	40.23	11.80
	T_3	40.20	14.70
2016	T_1	37.33	11.60
	T_2	40.30	12.40
	T_3	40.10	13.60

Table 2: *Proximate composition of Nile tilapia in 2015 and 2016.*

Year	Treatment	Crude protein (%)	Fat (%)	Dry matter (%)	Ash (%)
2015	T_1	55.82	4.6	23.59	17.66
	T_2	59.03	3.77	21.79	20.73
	T_3	76.12	2.79	21.12	22.80
2016	T_1	65.80	8.50	26.97	15.82
	T_2	69.36	4.46	26.82	16.01
	T_3	72.97	2.67	25.20	23.63

Similar results were reported by Thaker *et al*. (2012) where they found an increase in total protein in cyprinus carpiro in magnetically treated water compared to control.

The magnetized water decreased the fat percentage as seen in Table (2), where a significant decease in fat percentage was observed from 4.6% at the control to 3.77% at treatment T_2 and 2.79% at treatment T_3. In the second year experiment the fat percentage decreased from 8.50% at the control to 6.46% at T_2 and 2.67% at treatment T_3. Mohammed *et al*.

(2010) found that the nutritional elements of the Nile fish showed variable values with crude protein recording the highest values and lipid recording the lowers. This fat content in this study was lower than that reported by Bolwba *et al*. (2011) 18.60%.

The higher dry matter percentage was observed at T_1 the control, 23.59%, then decreased to 21.79 at T_2 and 21.12% at T_3 in the first year experiment. In the second year experiment the values ranged from 25.20 – 26.97%.

The ash content in the first experiment was 17.66%, 20.73% and 22.80% at treatments T_1, T_2 and T_3 respectively. In the second experiment the values ranged from 15.82 at T_1, 16.01% at T_2 and 23.63% at T_3. the ash content in the first and second experiment was higher than those reported by Effiong and Mohammed (2008), and the value reported by Effiong and Fakunle (2011). This could be attributed to the fish species season, sex or food availability as reported by Effiong and Mohammed (2008).

Conclusion

This study have shown that the magnetized water as a positive effect in body weight gain, crude protein, fat, ash and dry matter content. More research is needed to use different magnetic power for treating water and fish feed.

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