



Some Macro and Micro Elements in *Malapterurus Electricus* and *Gymnarchdae Niloticus* Fish from Khartoum Fish Market

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Abstract

The study was conducted in Sudan university of science and technology, march 2022, samples were collected from Khartoum fish market, The objectives of this research were to determine some macro mineral (Phosphorus (P), Calcium (Ca) and Magnesium (Mg)) which they analyzed using flame photometry and micro mineral (Copper (Cu) and Lead (Pb)) analyzed using Atomic Absorption Spectrometry in the muscles of two common fish species in Sudan (*Malapterurus electricus* and *Gymnarchdae niloticus*). Only edible flesh was analyzed. Single factor ANOVA analyses show that all minerals analyzed except copper varied significantly between the studied species, ($p \le 0.05$).

Keywords: Lead; Copper; Phosphorus; Calcium

Introduction

Chemicals required for the normal maintenance of the human body are referred to as essential elements in human nutrition [1]. These substances take part in a number of biochemical processes, the development of bones and teeth depends on mineral calcium. Magnesium and phosphorus [2,3]. Fish at the bottom of the aquatic food chain have the potential to accumulate metals and transmit them to humans [4]. Minerals components such as magnesium, calcium, phosphorus is important for human nutrition [5]. Phosphorus is a mineral that is required for normal fish growth, bone formation, reproduction and energy metabolism. [6]. Ca/P ratio is the most important indicator for good bone health [7]. Copper is an essential element that helps as a cofactor in a variety of enzyme systems for most living organisms. However, at high concentration, copper becomes a toxic pollutant. Copper has long been used as an effective algaecide in farm ponds and aquaculture activities [8]. Copper (Cu) for example, is required for the growth and metabolism of living organisms [9]. An insufficiency of copper causes arterial weakness, liver problems, and anemia. Although these metals are essential, fish can accumulate them causing their concentrations to rise above the toxicity threshold, making them potentially toxic to humans [10]. Other heavy metals such as lead (Pb) are known to be non-essential to human health, and in addition to being toxic for aquatic organisms, can also be harmful to human health at extremely low concentrations [10,11].

Materials and Methods

Samples of this study were collected from the central fish market in Khartoum state, nine replicates of *Gymnarchus niloticus* and *Malapterurur electricus* were purchased and transported in an insulated container under chilled condition prior to use, samples were taken from edible parts in fish body for analysis of macro and micro elements.

Macro and Micro Elements Determination

The major elements, comprising macro (P, Ca and Mg) were determined using corning 400, flame photometer (AAS)-986. Approximately (5)g of each sample (wet weight) was placed in a Teflon digestion vessel and double acid digested with nitric acid (HNO_3) and perchloric acid ($HCLO_4$). Samples were then analyzed for mineral contents., then micro elements (Cu and Pb) analyzed using the Atomic Absorption Spectrophotometer (Shimadzu AAS,

AA-6300).

Statistical Analyses

Data were analyzed using SPSS software version 21. One Way Analysis of Variance (ANOVA) test, the means were compared to see the differences.

Result

Table 1, Figure 1, Table 2 and Figure 2.

Table 1: This table shows macro elements amount in mg/100g in studied fish muscles (Mean±SD)

Studied Fish Species	Phosphorus(P)	Calcium (Ca)	Magnesium (Mg)
Malapterurus electricus	440.3± 93.8	581.5±39.7	380.8±83.9
Gymnarchus niloticus	329.6±66.0	521.0±18.5	310.2±20.7
Sig	*	*	*

Sig: Significant difference,

*: mean values were significant at (P<0.05).

Table 2: This shows some heavy metals amount in mg/100g in studied fish muscles (Mean±SD)

Studied Fish Species	Copper (Cu)	Lead (Pb)
Malapterurus electricus	0.116 ± 0.01	0.190±0.07
Gymnarchus niloticus	0.119±0.07	0.164±0.01
Sig	NS	*

Sig: Significant difference,

*: mean values were significant at (P<0.05),

NS: Not significant







Figure 2: This shows difference in micro elements in the flesh of studied fish species.

Discussion

Phosphorus (P)

It's an important component of bones. The concentration of this mineral varied significantly between species. ranging from 440-3295mg/100g, the highest P content of 440mg/100g obtained from *Malapterurus electricus* The P concentration range obtained in this study is in the same range of [12] which is range 68-550mg/100, and other freshwater fish obtained through the study of [2], (232-426mg/100g) and higher than the finding of Tao et al. (2012), (198-240mg/100g). and lower than results obtained by Mohamed et al. [13] who found Phosphorus contain 727-935mg/100g and Luczynska et al. [14] found 1047-1261mg/100g. Adults are advised to consume 700mg of phosphorus per day and 100gm of fish. These fish species can provide at least 62% of the daily requirement.

Calcium (Ca)

In this study calcium ranged from 521 to 581mg/100 g which is within FAO mean values of 19-881mg/100g and in the same range of the finding of Mohamed et al. [13] study (107-588mg/100g) however its higher than Luczynska et al. [14] who obtained calcium content in the range of 53-103mg/100g. The acceptable dietary calcium intake of for adult people is 1000-1300mg [12]; these findings show that fish are an excellent source of calcium accounting for more than 100% of the daily requirement. According to these findings, it can be supposed that consumption of these fishes on a regular basis will enhance bone formation and preserve skeletal integrity.

Magnesium (Mg)

Magnesium is a component of bones. Results of this study are higher than values obtained by Adeniyi et al. [15] who found that magnesium in fish was 29-41mg/100g and an average of 36.4mg/100g obtained by Martinez V et al. [16]. Adults should consume 220-260mg of magnesium per day [12], and the studied fish species can achieve 100% of this requirement in a 100gm portion of fish flesh.

Copper (Cu)

Copper is found in many enzymes but only in trace amounts in food. According to Wildman et al. [17] in human nutrition, the daily copper requirement ranges between 1.5 to 2.5mg. The Content of copper in fish species from this work varies between 0.116-0.119 mg/100 g. This is significantly less than the daily allowance. There is no significant difference in Cu concentrations (P<0.05) between species.

Lead (Pb)

The concentrations of lead in this study showed it was between the lowest value in muscles of *Gymnarchus niloticus* 0,164mg/100g and the highest value in *Malapterurus electricus* 190mg/100g, Lead concentration showed significant (P<0.05) difference between the studied fish species. The study findings were consistent with those reported by many other researchers Hamouda [18]; Othman et al. [19] and Perziosi et al. [20].

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