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Analysis of Mineral Contents of Fresh ond Dried Tilapia Fish (*Oreochromis Niloticus*) from Mcaiver Market, Warri South Local Government Area of Delta State, Nigeria

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ABSTRACT

The study of mineral contents of fresh and dried tilapia fish (*Oreochromis niloticus*) from Mcaiver Market, Warri South Local Government Area of Delta State, Nigeria were determined. The tilapia fishes were shared into two parts: one part was used to determine the mineral content of the fresh fish and the other part was oven dried before the analysis of mineral contents of both fishes. The minerals detected were in the order Na>Ca>K>Mg>Zn>Fe. It was observed that dried tilapia fish was more nutritional than the fresh tilapia fish. Dry tilapia fish should be consumed rather than fresh tilapia fish for proper nourishments.

Introduction

Fish is one of the potential sources of animal protein and essential nutrients for the maintenance of a healthy body compared to other sources of protein [1]. In recent times, fish has become favourite food stuff for the majority of societies because of several health benefits [2]. The major components of fish are water, protein, lipids and carbohydrate [3] while the following minerals are commonly found in fish, sodium, potassium, calcium, magnesium, phosphorus, sulphur, iron, chlorine, silicon, manganese, zinc, copper, arsenic and iodine [4]. The knowledge of fish composition is essential for its maximum utilization. The nutritional composition of fish varies greatly from one species and individual to another, depending on age, feed intake, sex and sexual changes connected with spawning, the environment and season [5]. Processors have direct interest in the proximate composition of fish in order to know the nature of the raw materials before chilling, freezing, smoking and canning can be correctly applied [6]. Moreover, the measurement of some proximate profile such as protein contents, carbohydrates, lipids, moisture content and ash percentage is often necessary to ensure that they meet the requirements of food regulations and commercials specifications [3].

In Nigeria fish is consumed in large quantities and it is one of the main products consumed in term of animal protein. It is cheap and highly acceptable with little or no religious bias [7]. Fish is a very important source of animal protein in the diets of man [6]. Smoked or dried fish is a natural part of the diet of a large section of the world's population. However, the demand of fish is increasing due to increase in population. The poor post-harvest handling, lack of processing and storage facilities and utilization of unconventional fish species has been a major challenge [8]. Spoilage is a metabolic process that causes food to be unacceptable for human consumption due to changes in quality and nutritional characteristics [9].

The processing and preservation of fresh fish were of utmost importance since fish is highly susceptible to deterioration immediately after harvest and also to prevent economic wastes [10]. Fish preservation methods are applied to extend the shelf life. These include freezing, smoking, drying and heat treatment (eg.sterilization, pasteurization, etc). Among the methods of long term preservation of fish, smoking is perhaps the simplest method as it does not require sophisticated equipment or highly skilled workers.

Studies on the proximate composition of tilapia fish (*Oreochromis niloticus*) smoked in Nigerians Stored Products Research Institute (NSPRI) showed that drying have a positive effect on fish since there was an increase in nutritional parameters [11]. Therefore, considering the nutritional benefits associated with fish consumption; it is important that fish mineral contents be assessed in order to establish the nutritional level of fish species prior to their consumption. Hence the study of mineral contents of both fresh and dried *Oreochromis niloticus* (Tilapia fish) from Ogbe-Ijoh market in Warri South Local Government Area of Delta State, Nigeria.

Purpose of the Study

The purpose of the study is to determine the mineral contents of both dried and fresh tilapia fish sold in Mcaiver market in Warri South Local Government Area of Delta State.

Objective of the Study

i. To determine the mineral content of iron (Fe) and zinc (Zn) found in tilapia fish for both dried and fresh spp.

ii. To determine the mineral content of Phosphorus (p) and potassium (K) found in tilapia fish for both dried and fresh spp.

iii. To determine the mineral content of sodium (Na) and Calcium (Ca) found in tilapia fish for both dried and fresh spp.

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Materials and Methods

Area of Study

The study area Mcaiver Market is in Warri-South Local Government Area of Delta State. It lies between Latitude 5°3'5.11"N and Longitude 5°40'44.11"E, altitude 13.5 – 17.5 m. The area is in oil rich Niger Delta-Nigeria and as such, the major activities are characterize by oil & gas exploration activities from Chevron Nigeria Limited, petrochemical refining from the Warri Refinery and Petrochemical Company, a subsidiary of Nigerian National Petroleum Corporation (NNPC) and allied companies. The economic activities of these companies has undoubtedly increased human population and thus, dumping of waste materials directly into the river, mainly from Delta Development Property Agency (DDPA). Others are aquaculture business along the river stretch, auto-mechanic workshops, wood-logging, cloth washing, bathing and swimming.

Sample Collection

Three fishes of each of each type of Tilapia fish (*Oreochromis niloticus)* both fresh and dried were bought from Mcaiver market in Warri-South Local Government Area of Delta State Samples were collected in ice chests containing ice blocks and transported to the Biology laboratory of College of Education, Warri for analysis. The fish were identified using fish identification guide by FAO [6].

Sample preparations

The fish samples were bought from traders at Mcaiver market. The fish samples were thoroughly washed and rinsed with de-ionized water to remove any adhering contaminants and then drained under fold of filter paper. The weights of the fresh fish samples were taken. The whole fish samples were oven dried for four days at a temperature between 95 to 105°C until a constant weight, the sample grinded and kept in a sample bottle prior analysis.

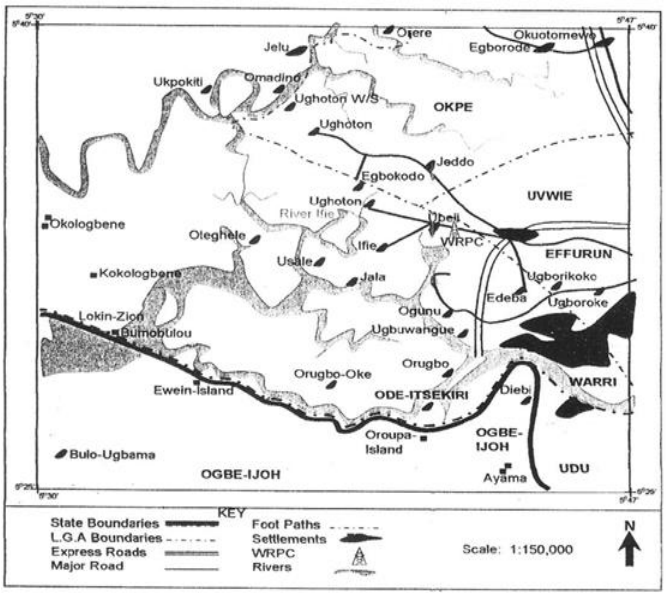

Figure 1. Map of Warri-South L.G.A showing Sampling Location.

Mineral Analysis

The major elements, comprising calcium, magnesium, potassium and trace elements (iron and zinc) were determined according to the methods of Shahidi *et al* [12]. The ground samples were sieved with a 2mm rubber sieve and 2g of each the samples were weighed and subjected to dry ashing in a well-cleaned porcelain crucible at 55ºC in a muffle furnace. The resultant ash was dissolved in 5ml of HNO_3/HCI/H_2O (1:2:3) and heated gently on a hot plate until brown fumes disappeared. The solution in each crucible, 5ml of deionized water. The solution in each crucible was transferred into a 100ml volumetric flask by filtration through a Whiteman No 42 filter paper and the volume was made to the mark with deionized water. The solution was used for elemental analysis in an Alpha 4 Atomic Absorption Spectrophotometer (Chem Tech Analytical) attached to Alpha graphite atomizer A270 with a Gateway 2000 computer printer [12].

Results

The results of mineral compositions (mg/100 g) in both wet and dried Tilapia fishes are stated in Table 1 below.

Table 1. Mineral Contents (mg/100 g) of Dry and Fresh Tilapia (*Oreochromis niloticus*)

Element	FAO (2001)	Dry	Fresh
Na	30-134	75.13	72.33
K	19-502	91.51	83.66
Ca	19-881	18.20	16.10
Mg	4.5-452	41.35	40.52
Zn	0.23-2.1	2.39	1.09

Source: Field Work, 2019

The mineral composition of both fresh and dry Tilapia fish sold at Mcaiver market are presented in Table 1. The concentrations of Zn, Fe, Pb, Mn, ranged between 1.00 to 2.10, 1.56 to 3.46, 0.01 to 0.11 and 0.89 to 2.42 mg/100 g, respectively. This similar observation has been observed by Asaolu and Olaofe (2004) [14] for fishes and crayfish from coastal water of Ondo State. The result was also lower than the report of Adeyeye and Adamu [13] on Gymnarchus niloticus. However the mineral concentrations in both dry and fresh Tilapia fishes were within FAO [6] standards for minerals in fish muscles.

The extent of the concentration of these metals in fish sample can suggest to what degree a particular fish picks up particulate matter from the surrounding water and sediment while feeding, bottom feeder are known to concentrate more metals than the surface feeder . The high level of iron and manganese in the fish could be associated with the fact that these metals are naturally abundant in Nigerian soil [14, 15] and no matter the source of the metals the final repositories are the aquatic system. The levels of the metal are below the limit set by World Health Organisation standard for food [16]. The concentration of Ca, Mg, Na and K ranged between 6.20 to 10.10, 5.86 to 6.20, 6.40 to 8.60 and 8.90 to 10.10 mg/100 g, respectively. Potassium is the most abundant metal in the fish samples from all the dams, the metals under investigation are not known to be toxic to fish, their bio-accumulation could be very beneficial to man since thy are essential minerals in human nutrition [17].

The mineral contents of the Tilapia (*Oreochromis niloticus*) samples are shown in table 1. The dried niloticus has the highest calcium (18.20 mg/kg) while the fresh niloticus has the least calcium content (16.10 mg/kg). The dried niloticus has the highest magnesium content (41.35 mg/kg) while the fresh niloticus has the least magnesium content (40.52 mg/kg). The dried niloticus has the highest amount of sodium (75.13 mg/kg) while the fresh niloticus contains the least amount of sodium (72.33 mg/kg). The dried niloticus has the highest Potassium content (91.51 mg/kg) while fresh niloticus has the least amount of potassium (83.66 mg/kg). The dried niloticus has the highest Zinc content (2.39 mg/kg) while the fresh niloticus has the least amount of zinc (1.09 mg/kg). The nutritional elements showed variable values in all the fishes analyzed; with crude Protein recording the highest values and lipid recording the lowest.

This makes the fishes important living resources of dietary Protein as other sea and freshwater fish [18]. High lipid fishes had less water and more Protein than low- lipid fishes. This is in-line with the report of Steffens (2006), that Protein forms the largest quantity of dry matter in fish.

All the fish samples examined contained appreciable concentration of Potassium, Sodium, Magnesium and Calcium suggesting that these fishes could be used as good sources of mineral. Potassium was observed to dominate other mineral in all samples. The two heavy metals analyzed were present, but within tolerable limits. The variation recorded in the concentration of the different nutritional components in the fish examined could have been as a result of the of the rate in which these component are available in the water body and the ability of the fish to absorb and convert the essential nutrients from the diet or the water bodies where they live. This is supported by the findings of Fawole *et al*.[1] Other elements (such as Zinc and iron) varied in concentration among the three fishes studied most of these micro elements are equally important in trace amount as observed, but they tend to become harmful when their concentrations in the tissues exceed the metabolic demand. Minerals are important for vital body functions such as acid, base and water balance. Calcium is good for growth and maintenance of bones, teeth and muscles [13]. Normal extra cellular calcium concentrations are necessary for blood coagulation and for the integrity, intracellular cement substances [20]. Sodium is an activator of transport ATP-ases in animals and possibly also in plants [13]. There is also a relationship of sodium intake with hypertension on human [1]. The presence of Zinc in the fishes could mean that the fishes can play valuable roles in the management of diabetes, which result from insulin malfunction.

Conclusion

From the results, it can be concluded that dried tilapia fish has more mineral nutrients than the fresh tilapia fish. The dried fish from the Mcaiver market in Warri South Local Government Delta State Warri will contribute to the nutritional qualities and growth of human being as indicated by high calcium, zinc, potassium, sodium, and magnesium content and the various amino acid compositions. The levels of the metals are within the standard limit set for fish in the food and agricultural organization (FAO) and world health organization (WHO).

It is therefore recommended that smoked tilapia fishes be bought in quantities that can be exhausted as quickly as possible in order to avoid any form of deterioration that may occur as a result of prolong storage in ambient conditions. Dried tilapia fish should be consumed rather than fresh tilapia fish for proper nourishments of the body.

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