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Proximate and Mineral Composition of Some Commercially Important Fishes in Lake Kainji, Nigeria

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ABSTRACT

Study on the proximate and mineral composition of 5 commercially important freshwater fish species (*Clarias gariepinus, Oreochromis niloticus,Lates niloticus,Bagrus bayad and Citharinus cithrus*) from Lake Kainji, Nigeria was conducted using standard procedures. Protein content was in the range (21.62% -60.57 %) in the fish samples, ether extract was (3.88 % - 9.1 %) while ash and crude fibre were (1.35 % -5.88 %) and (0.37 % -1.5 %) respectively. Mineral elements detected were in the order Na>Ca>K>Mg>Fe>Zn>P. Cadmium and lead were not detected in any of the fish species analysed .Levels of mineral elements in fish species were within WHO recommended limit.
KEY WORDS: Proximate composition, mineral elements, freshwater fishes, Lake Kainji

INTRODUCTION

Fish is very important food stuff, especially in developing countries due to its high protein content and nutritional value of unsaturated fatty matter. It may be the sole accessible and / or affordable source of animal protein for poor households in urban or semi-urban areas (Bene and Heck, 2005). Fish is also widely acceptable because of its high palatability, low cholesterol and tender flesh (Eyo, 2001).However the feeding habit, sex, species, seasonal variation and other factors greatly affect the nutrient composition of an individual fish species (Lagler *et.al*, 1977; Effiong and Mohammed, 2008).

Determination of some proximate profiles such as protein content, lipid, ash and other nutrients is often necessary to ensure that they are within the range of dietary requirement and commercial specifications (Watchman, 2000). The study of micro- nutrients present in living organisms is of biological importance because many of such micro-nutrients take part in some metabolic processes and are known to be indispensable to all living things (Shul'man, 1974). Fishes contain small amount of these micro-nutrients some of which are essential nutrients, being components of many enzymes system and metabolic mechanisms that contribute to the growth of the fish. The most important micro-nutrients in form of mineral salts include Ca, K,P,Fe, Cl, while many others are required in trace amount. The deficiency in these principal nutritional mineral elements induces a lot of malfunctioning as it reduces productivity and causes diseases such as inability of blood to clot, osteoporosis, anemia etc. (Shul'man, 1974, Mills, 1980).

This experiment was therefore conducted to determine the proximate composition and micro-nutrients of some commercially important freshwater fishes from Lake Kainji, Nigeria.

MATERIALS AND METHOD

Freshly caught samples of 5 commercially important fish species namely *Clarias gariepinus,Oreochromis niloticus,Lates niloticus,Bagrus bayad* and *Citharinus citharus* were purchased from Monai, a fish landing site in the Kainji Lake Basin. They were brought to the Wet Laboratory of the Fish Processing Unit, Federal College of Freshwater Fisheries Technology, New Bussa, Nigeria, where they were gutted, washed thoroughly and smoke-dried to constant weight using the model Kainji Smoking Kiln. The dried samples were ground with mortar and pestle into fine powder and stored in polythene bag for analysis.

PROXIMATE NUTRIENT ANALYSIS

The methods for analysis were the standard procedures of AOAC (1990). Moisture content was determined by oven drying (at 105°c) overnight, ash by incineration of 2g of each sample in a muffle furnace (Lenton Furnaces,

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England) at 600°c for 2 hours, protein (Nx6.25) by the micro kjeidahi method, crude lipid was extracted within n-hexane in a soxlet extractor, crude fibre by acid base- digestion using 1.25% H_2So_4 (W/V) and 1.25% NaOH(W/V) solution, available nitrogen free extract was calculated by difference. Energy value of the sample was estimated (Kcal; 100g) by multiplying the percentage of crude protein, crude fibre and NFE by the factors of 16.7, 37.7 and 16.7 respectively (Vadivel and Janardhanan, 2000b). All proximate components were analysed in triplicate and reported as mean on % dry weight basis.

MINERAL ANALYSIS

This was done by triple acid digestion according to the method described by Hassan and Umar (2004). Iron, copper, magnesium, calcium, zinc, lead and cadmium were analyzed by atomic absorption spectrophotometer (Alpha 4 model), while flame photometer (Corning 400 UK) was used for sodium and potassium analysis.

All determinations were done in triplicate and reported as mean mineral content in mg/100g dry matter (DM).

Statistical analysis of all data collected was conducted using analysis of variance (ANOVA) and least significant difference (LSD).

RESULTS AND DISCUSSION

The mean percentage proximate composition of the analyzed samples is shown in Table I. The protein content was in the range of (21.62% - 60.57%). These values indicate that they are a rich source of protein to consumers. This finding is similar to that reported by Mumba and Jose (2005). The values were higher than those reported in beef, pork, lamb, mackerel and oyster (Eyo, 1998, 2001). Abdullahi (2001) reported that the protein content in fish range with species due to certain factors such as the season of the year, effect of spawning and migration, food availability etc. The ash content was higher in the fish species used for this experiment than those reported by Effiong and Mohammed (2008) with highest values (5.88 and 5.50) respectively in L*ates niloticus* and *Bagrus Bayad*. This could be attributed to the fish species, season, sex or food availability. Effiong and Mohammed (2008) reported these factors as being responsible for such variations. The fatty fishes (*B. bayad, C. gariepinus* and *C. citharus*) had higher percentages of ether extract, 9.1%, 8.76% and 5.12% respectively. Onyia *et al*., (2010) reported similar findings.

Table I: Percentage mean proximate composition of experimental fish samples

Fish sample	Crude protein	Crude fibre	Ether extract	Ash content	Moisture	NFE	Energy value	Dry matter
Clarias gariepinus	58.60	1.13	8.76	2.92	18.20	2.87	387.16	90.11
Oreochromis niloticus	52.58	1.49	4.17	2.55	10.12	1.50	373.11	91.24
Lates niloticus	43.57	0.37	3.88	5.88	11.28	10.21	343.26	93.31
Bagrus bayad	60.57	1.50	9.1	5.50	8.80	6.71	397.49	92.4
Citharinus citharus	21.62	0.75	5.12	1.35	17.16	13.34	353.21	85.33

The result of the mineral analysis in the experimental fish samples showed highest values in Na and Ca in all the samples respectively. Saadettin *et al*., (1999) reported that the most abundant micro element in fish were Zn and Fe followed by Cu with the remaining element present in amounts below toxic levels.

Table 2: Means of mineral elements in fish samples from Lake Kainji (mg/g)

Elements	*C.gariepinus*	*O.nilotus*	*L. niloticus*	*B.bayad*	*C. citharus*
Ca	2.91	2.86	2.85	2.89	2.77
K	0.71	0.76	0.64	0.63	0.63
Mg	0.28	0.32	0.29	0.21	0.21
P	0.021	0.023	0.036	0.02	0.023
Zn	0.084	0.071	0.080	0.073	0.042
Fe	0.086	0.081	0.009	0.014	0.14
Na	3.2	3.1	2.8	3.0	2.9
Cd	ND	ND	ND	ND	ND
Pb	ND	ND	ND	ND	ND

ND= Not detect

The high levels of these two elements in the fish samples may be attributed to the rate in which they are available in the water body and the ability of the fish to absorb these inorganic elements from their diet and the environment where they live (Adewoye and Omotosho, 1997, Ibiyo *et a*l., 2006). Eyo (2001) reported that the mineral content of fish makes fish unavoidable in the diet as it is a source of different minerals that contribute greatly to good health. The wide array of minerals detected from these species attest to this.
However mineral composition recorded variations in their concentrations among the selected fish species used for the study. Windom *et al*., (1987) attributed such variations to the chemical forms of the elements and their concentration in the environment.

Cadmium (cd) and lead (pb) were not detected in all the fish species sampled. Akin and Salihu (2004) reported similar findings from their study.Oguzie (2009) however reported the presence of lead in some fish species. Onyia (2010) also stated that the levels of most of these mineral elements present in fish species are in trace amount and within WHO limits for human consumption.

Conclusion

This study have shown these fish species from Lake Kainji, Nigeria as good source of nutrients to the consumers and within the limits required by the body for healthy growth and development. The study has also provided an insight into the mineral content of these species in line with food safety when consumed.

Since the nutritional value of these fish samples have been known, consumers can now know the benefit to derive when these fishes are consumed.

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