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PROXIMATE AND MINERAL CONTENT OF TRADITIONAL SMOKED FISH SPECIES FROM LAKE KAINJI, NIGERIA

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ABSTRACT
Investigation into proximate and mineral content of three commercially important fish species *(Lates niloticus, Clarias anguillaris* and *Hemisynodontis membranaceus* using the traditional smoked method was conducted. Proximate analysis showed significant differences (P< 0.05) among the fish samples. However, there was no significant difference in their mineral content. Crude protein in fish samples was in the range (26.54±26 – 36.56±0.22) while fat was (16.43±0.18-24.18±0.43). Ash content was however in the range (0.43±0.23 – 4.41±0.44). The result of the mineral content indicated highest values in phosphorous and magnesium in all three species (108.14±42.34 – 119.23±54.64) and (79.10±8.38 – 98.57±12.8) respectively. Iron had the least value in range (9.84±1.16 – 16.47 ± 2.18) among the fish samples. Heavy metal such as cadmium and nickel was not detected from fish samples

KEY WORDS: Traditional smoked fish, Proximate, Mineral content

INTRODUCTION

Traditional fish processing is a common practice among the local fisher-folks of the Kainji Lake Basin in Nigeria like in most sub-Saharan African countries. Although several efforts have been made by both the National Institute for Freshwater Fisheries Research (NIFFR) and Federal College of Freshwater Fisheries Technology (FCFFT), New Bussa located in the Kainji Lake, to improve the processing methods of fish and its products among the local fisher- folks by introducing improved smoking kilns and processing techniques, adoption of these technologies among them is still very low. Kainji Lake is a major source of Inland fisheries in Nigeria with a lot of studies on its fishery resources potential conducted by both institutions aforementioned. Some studies have also been conducted on the nutrient composition of some fish species from this lake especially using the improved drying smoking and processing techniques (Effiong and Mohammed, 2008; Eyo, 1998; Effiong and Fakunle, 2009; Fakunle *et al.*, 2009; Fakunle *et al.*, 2010). However, nutritional studies of these fish species using the traditional smoking method practiced by the local fisher-folks have not been conducted elaborately. Therefore this study was carried out to determine the proximate and mineral content of three commercially important fish species from Lake-Kainji using the traditional smoking method.

MATERIALS AND METHOD

Freshly caught samples of three fresh water fish species (*Lates niloticus*, *Clarias anguillaris* and *Hemisynodontis membranaceus* were purchased from Monai, a fishing settlement on the Kainji Lake basin and brought to the Wet Laboratory of Federal College of Freshwater Fisheries Technology, New Bussa, Nigeria, where they were gutted, thoroughly washed and smoked-dried to constant weight using the traditional smoking kiln with precautions to prevent cross contamination. The proximate composition of the fish samples was determined using standard procedures of AOAC (1990) while mineral content was by wet ashing /oxidation method. Mineral elements were analyzed by Atomic Absorption Spectrophotometer, while Na and K were by flame photometry (Model AAS 200A Buck Scientific). P content was by *phosphor-vanadomolybdate* method.

RESULTS

The results of the proximate composition of the experimental fish species is shown in Table 1. The moisture content in all the samples was low with no significant difference (p>0.05). Protein and fat content were generally high in all samples. However, the highest protein value (36.56±0.22) was recorded in *Clarias anguillaris.* There was significant difference (p>0.05) in protein value among the fish samples. *Synodontis membranaceous* had the highest fat value (26.18±0.43).
The result of the mineral content is shown in Table 2.There was no significant difference (p>0.05) in the minerals detected (Iron, potassium, magnesium, phosphorus and zinc) across the fish samples. Among elements not detected were manganese, copper, nickel and cadmium. Phosphorus and magnesium had the highest values in all the fish samples. The fish samples presented a relatively higher and lower amount of proximate concentrations in the order of *C. gariepinus* > *S. membranaceous* > *L. niloticus.*

TABLE 1: Percentage means proximate composition of fish samples from Lake Kainji.

Fish sample	Moisture	Ash	Protein	Fat	Crude Fibre
L. niloticus	7.42±0.48	4.41±0.44	32.44±0.47	16.43±0.18	0.94±0.55
C. gariepinus	8.52±0.12	2.76±0.16	36.56±0.22	22.28±0.66	1.85±0.62
S.membranaceus	8.62±0.29	0.43±0.23	26.84±26	26.18±0.43	1.78±0.33

Values are means of three replicates ±SD.

TABLE2: Mean mineral composition of fish samples from Lake Kainji

	L. niloticus	*C.gariepinus*	*S.membranaceus*
Fe	16.47±2.18	12.28±1.24	9.84±1.16
Mg	79.10±8.38	98.57±12.80	81.46±17.62.
K	63.32±8.78	72.09±8.78	58.52±16.93
Zn	20.89±5.08	22.43±0.32	19.30±4.56
Na	50.63±8.51	52.44±6.38	48.40±3.37
Ca	21.96±3.44	20.87±6.50	26.94±1.72
P	112.88±38.42	108.14±42.32	119.23±54.64

Values are means of three replicates ±S

DISCUSSION

Fish is a highly proteinous food consumed by the populace. A larger percentage of consumers do eat fish because of its availability, flavor, and palatability while fewer percentages do so because of its nutritional value. Therefore studies on the proximate composition and elemental composition of the freshwater fishes have not really caught the attention of researches in fisheries; hence the consumer and fishery workers are left with limited or paucity of information on the importance of a particular fish species in their daily diets (Adewoye *et al*., 2003). Ogbonnaya and Shaba (2009) reported no negative effect of the drying processes on the proximate and mineral values in catfish except losses in the energy value. The moisture content in all samples was low with no significant difference (P>0.05). Ahmed *et al* (2011) reported similar result and attributed this to the fact that during smoke- drying the fish flesh loses water in the initial phase that could be compared to cooking (first 3 hr at 80^{o}c) in addition to a protective coating formed due to partial carbonization of tissue and other components by wood smoke. There was significant difference (P>0.05) in protein value among the fish samples but was generally high. The relatively high to moderate percentage crude protein may be attributed to the fact that fishes are good source of pure protein, but the observed difference in value could be due to absorption capability and conversion potentials of essential nutrients from their diets or their local environment (Adewoye and Omotosho, 1997).*Synodontis membranaceus* had the highest fat content (26.18±0.43).Similar findings have been reported by Effiong and Mohammed (2008). Huda *et al* (2010) reported that nutrient content of fish is influenced by several factors including smoking method and time. The result of the proximate composition generally showed these fish species as good source of protein higher than those of sheep meat (17.2g/100), cow meat (19.6g/100) and pork (19.4g/100); (Hladik and Leigh, 1993). Smoked-dried fish is the most acceptable form of fish product in Nigeria (Stolyhwo and Sikorski, 2005; Yanar *et al*; 2007). The result of the mineral content is shown in Table 2. There was no significant difference (P>0.05) in Fe, K, Na, Mg, P and Zn content of the fish samples. Phosphorus and magnesium had the highest values in all the fish samples. Concentrations of potassium were equally high in the fish samples. Onyia *et al.,* (2010) reported similar findings and attributed this to the dominance of the element in the water body where the fish lives. Saadettin *et al.,* (1999) reported that the most abundant micro element present in fish were Zn and Fe followed by Cu with the remaining elements present in amounts below toxic levels. The high levels of these two elements (P and Mg) in these fish species may be attributed to the rate in which they are available in the water body and the ability of the fish to absorb these organic elements from their diet and the environment where they live (Adewoye and Omotosho, 1997). Eyo (2001) reported that mineral content of fish makes it unavoidable in the diet since mineral contribute greatly to good health.

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