Journal of Biotechnology Research
ISSN(e): 2413-3256, ISSN(p): 2413-8878
Vol. 2, No. 5, pp: 36-38, 2016
URL: http://arpgweb.com/?ic=journal&journal=16&info=aims

Proximate Analysis of *Clarias gariepinus* and *Oreochromis niloticus* Caught From River Rima, Sokoto-Nigeria

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Abstract: Proximate composition of two freshwater fish species (*Clarias gariepinus* and *Oreochromis niloticus*), caught from River Rima were examined. The results revealed variation in nutrient composition, crude protein content ranged from 17.95 to 35.44% in flesh, bones and heads. *arias gariepinus* has the highest moisture content of 22.5% than *Oreochromis niloticus* with 9.50% in flesh parts. *Clarias gariepinus* has the highest crude protein of 35.44%. The study provides valuable information of *Clarias gariepinus* and *Oreochromis niloticus* status on their proximate composition.

Keywords: *Clarias gariepinus*; Nutrient; *Oreochromis niloticus;* Proximate; River Rima.

1. Introduction

Fish is widely acceptable because of its high palatability, low cholesterol, tender flesh, cheap and its aroma in cooking [1]. Feeding habit, gender, species diversity, seasonal variation, climate change and other environmental features greatly affect the nutrient composition of individual fish species [2]. Evaluation of some proximate profiles such as protein contents, lipids, carbohydrates, moisture and ash percentages are necessary to ensure if they meet up the requirements of food regulations and commercial guidelines [3]. Fish is known to be one of the cheapest sources of animal protein and have essential nutrients needed in human diets [4]. Protein, fat and water content of fish are important to consumers, scientists and manufacturers for many aspects including nutritional value, seasonal variations and considerations regarding processing [5].

Some nutritional components of fish have functional effects on human health, for example, fish oil is one of the most important natural sources of polyunsaturated fatty acids, including eicosapentaenoic acid (EPA) and docosahexaenoicacid (DHA), which have been proven to have useful effects on human health [6, 7].

However, nutritional studies of many fish species have not been conducted elaborately [8]. The study was carried out to determine a comparative proximate and mineral content of two common consumed fish species in Sokoto, Nigeria.

2. Materials and Methods

2.1. Study Area

River Rima is located in Wamakko, Local Government area of Sokoto State Nigeria. It flows from North of Isa town and blocked at Goronyo Dam. Sokoto lies between longitudes $4^{o}8'$E and $6^{o}5'$E, and latitudes 12^{o}N and $13^{o}58'$N. Sokoto is tropical continental, rain falls between June and September, while during long dry season is from October to May [9]. The River is seasonal, usually over-floods its banks during peak rainy season in August and September, at times up to October.

2.2. Sample Collection

Samples of *Clarias gariepinus* and *Oreochromis niloticus* were bought at landing site from the fishermen at River Rima. The samples were oven dried and separated into three parts: Heads, Bones and Flesh. The samples were grinded separately and taken to laboratory for proximate analysis.

2.3. Proximate Nutrient Analysis

This was carried out by adopting standard procedures of AOAC [10]. 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, 2497 England) at 600°C for 2 hours, protein (Nx6.25) with micro khjelder method, crude lipid was extracted with hexane

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in a soxlet extractor, crude fibre by acid base- digestion using 1.25% H2So4 (W/V) and 1.25% NaOH (W/V), available nitrogen free was calculated. 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 [11]. All proximate components were analysed in triplicate and reported as mean on % dry weight basis.

2.4. Statistical Analysis

Data obtained was subjected to one-way analysis of variance (ANOVA) and means were separated using least significant difference (LSD) at 0.05 probability level.

3. Results and Discussion

In the present study, nutrient composition in *Clarias gariepinus* and *Oreochromis niloticus* was evaluated. Results revealed significance difference at P<0.05 for moisture, lipid, nitrogen, crude protein and carbohydrate (Table 1). Proximate composition is the basic constituents such as water, lipids, protein, carbohydrate etc. They are also regarded as energy yielding nutrients and important macronutrients for living organisms [12]. The results also shows that crude fibre did not indicate significant difference, so also ash which recorded 7.75% in *Clarias gariepinus*, however, 7.00% was obtained in *Oreochromis niloticus*. The disadvantage of high moisture content is that it increases fisher's susceptibility to microbial spoilage, oxidative degradation of polyunsaturated fatty acids, also decreases the quality of fish during long preservation [13]. The present findings indicates less moisture content in flesh especially in *Oreochromis niloticus* which recorded a mean of 9.5±2.50, while *Clarias gariepinus* 22.5±2.50 (Table 1) therefore the species may likely resist microbial spoilage. *Clarias gariepinus* gave a higher crude protein of 35.44% than *Oreochromis niloticus* which recorded just 18.69%. High to reasonable percentage crude protein may be attributed to the fact that fishes are good source of uncontaminated protein, but differences observed in values could be as a result of fish absorption capability and adaptation potentials of some essential nutrients from their diets [14, 15].

C. gariepinus had 22.5% moisture compared to *O. niloticus* that recorded 9.50%, these were obtained in flesh. Nutrient composition in head parts also varied. The two species were all significantly different in the following nutrients; moisture with mean difference of 11.7% (Table 2). Ash indicated significant difference recording means of 27.00%, 21.50% in *C. gariepinus* and *O. niloticus* respectively. Only crude fibre was not significant different between the two species. Proximate analysis in bones of both *C. gariepinus* and *O. niloticus* reveals that *C. gariepinus* has more moisture content of 9.25% than *O. niloticus* which has 4.75%. But their ash composition was more or less, with 29% for *C. gariepinus* and 30.75 for *O. niloticus.* Only nitrogen content revealed no difference between the two species (Figure 1), in which *C. gariepinus* recorded 3.10% while *O. niloticus* had 3.71% similar findings were reported [8]. The present results contradicts, findings of Gökhan and Hikmet [16] in Black Sea, which may likely be due the difference of environments were the fishes were caught.

Table-1. Percentage Means and their Standard Error of Proximate Composition in Flesh of *Clarias gariepinus* and *Oreochromis niloticus* caught from River Rima

Parameters	*Clarias gariepinus*		*Oreochromis niloticus*		Mean Difference (MD)
	Mean	SD	Mean	SD	
Moisture (%)	22.5	2.50	9.50	2.50	13.0[a]
Ash (%)	7.75	1.287	7.00	1.287	0.75[b]
Lipid (%)	20.75	4.035	14.00	4.035	6.75[a]
Nitrogen (%)	4.53	0.34	5.67	0.33	1.15[a]
Crude fibre (%)	0.10	0.05	0.10	0.05	0.00[b]
Crude Protein (%)	35.44	8.821	18.69	8.821	16.7[a]
Carbohydrate (%)	43.205	2.089	37.560	2.089	5.60[a]

Footnote: SE (Standard Error), MD (Mean Difference) Values are shown as mean and Standard error of triplicates. a= Statistically Significant at P< 0.05 when compared between the two species; b = Not Statistically Significant at P< 0.05.

Figure-1. Means of Nutrients Composition in Bones of *C. gariepinus* and *O. niloticus*

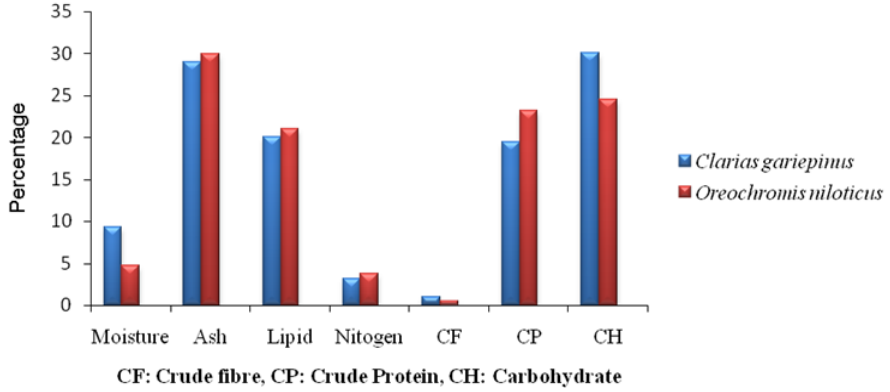

Table-2. Mean and Standard Error of Nutrient Composition in Heads of *Clarias gariepinus* and *Oreochromis niloticus* in River Rima

Parameters	*Clarias gariepinus*		*Oreochromis niloticus*		Mean Difference (MD)
	Mean	SD	Mean	SD	
Moisture (%)	16.50	8.487	4.23	8.487	11.7 [a]
Ash (%)	27.00	1.414	21.50	1.414	5.50 [a]
Lipid (%)	31.50	0.00	30.50	0.00	1.00 [a]
Nitrogen (%)	2.87	0.143	3.705	0.143	0.83 [a]
Crude fibre (%)	1.25	0.637	1.50	0.637	0.25 [b]
Crude Protein (%)	17.95	0.888	23.15	0.888	5.21 [a]
Carbohydrate (%)	22.31	0.615	23.35	0.615	1.04 [a]

Footnote: SE (Standard Error), MD (Mean Difference) Values are shown as mean and standard error of triplicates. a= Statistically Significant at P< 0.05.

4. Conclusions

Results suggest that proximate composition of these fish species varies, this might be due to physiological reasons and changes in environmental conditions (type of food available, starvation or heavy feeding). Species physiological characteristics might also contribute to the proximate composition. Therefore this study provides valuable information of variations of the two species proximate composition.

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