PROXIMATE COMPOSITION OF THREE FISH SPECIES CAUGHT IN ZOBE DAM, KATSINA STATE NORTH -WESTERN NIGERIA

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ABSTRACT

The study was carried out to investigate the nutritional composition of some fish species caught in Zobe dam Katsina state, Nigeria. Three fish species viz *Oreochromis niloticus, Bagrus bayad and Clarias gariepinus* were used for the study. The result revealed that the dry weight protein content was higher in *Clarias gariepinus* with a mean value of dry weight (54.97±14.34) followed by *Bagrus bayad* (54.19±9.63) and then *Oreochromis niloticus* (53.57±4.63) The fat content showed significant difference (P<0.05) with *Clarias gariepinus* having (4.03±0.75) *Bagrus bayad* (3.36±0.90) and *Oreochromis niloticus* (2.87±0.95). The ash content of *B. bayad* was (20.77±1.98), *O. niloticus* 15.61±0.50 and the lowest was recorded in *C. gariepinus* (11.3±3.43). Based on the present findings it can be established that the three fish species (*Bagrus bayad*, *Oreochromis niloticus*, and *Clarias gariepinus*) are good for human consumption as they are nutritionally rich.

Keywords: Proximate composition, *Clarias gariepinus, Oreochromis niloticus, Bagrus bayad*, Zobe Dam

INTRODUCTION

Fish is a vital source of food for people and contributes about 60% of the world's supply of protein (Abisoye *et al*., 2011). The advantage of fish as food is as a result of its high digestibility and high nutritional value. The nutritional characteristics of fish and fishery products are of vital interest to consumers, fishery products are highly nutritious and excellent means of obtaining dietary essentials, like protein, minerals and vitamins. In recent years, fish has become favorite foodstuff for the majority of societies because of several health reasons (Ali and Kumars, 2010).

The lack of sufficient protein is one of the most widespread nutritional deficiencies in many tropical countries (Ozkan, 2005). Fish has an important role in food security in both rural and urban areas of Nigeria, but little is known about the nutritional value of the fish that is normally utilized either fresh or preserved dried, salted or smoked. Fish of various species do not provide the same nutrient profile to their consumers (Ajah, 2009). These differences in the nutritional compositions of different species may be attributed to food composition, food and feeding habit, feeding rate, habitats, sex, age, size, genetic traits and season/migration (Abdullahi, 2001; Ajah, 2009).

Proximate composition is used as an indicator of fish quality. Chemical body composition of fish could illustrate its physiological condition and health (Saliu, *et.al* 2007). Proximate composition generally comprises the estimation of moisture, protein, fat and ash contents of the fresh fish body. They can differ in nature and quantity according to their function and availability (Saliu *et al*., 2007). The composition of a particular species often appears to vary from one fishing ground to another, and from season to season, but the basic causes of change in composition are usually variation in the amount and quality of food that the fish eats and the amount of movement it makes. Body composition can give idea about age classes of the same species or can compare nutritional differences between and among the species (Zafar and Ashraf, 2011). 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).

MATERIALS AND METHOD

Collection, identification and Preservation of the samples

The samples used for this study were *Clarias gariepinus*, *Oreochromis niloticus* and *Bagrus Bayad*. The samples were procured from Zobe dam fish landing site (Garhi). The Dam is located between latitude 12°20'34" - 12°23'27" N and longitude 7°27'57" - 7°34'47", in Dutsinma Local Government Area of Katsina State. The collected samples were brought to the Old Biology Laboratory at the Take-up Campus, Federal University Dutsin-ma for analysis. Identification was done based on the descriptions of Reed *et al*. (1967), Holden and Reed (1972) and Olaosebikan and Raji (1998). All the samples were collected fresh and refrigerated below 4°C prior to use. The samples were then beheaded, gutted, washed, filleted and oven dried before taking the powder for proximate analyses.

Proximate analyses

Crude Protein

Crude protein was determined by the Kjeldahl methods using sulphuric acid as a digester. Total nitrogen was quantified by titrating the distillate against 0.05M hydrochloric acid. Methylene blue and methyl red mixture was used as indicator. Crude protein was determined by multiplying the nitrogen value by the conversion factor of 6.25.

Crude Lipid Determination

Crude fat was obtained by exhaustively extracting 2.0 g of each sample in a Soxhlet apparatus using petroleum ether (b.p. 40 - 60 °C) as the extractant (AOAC, 2000).

Carbohydrate

Carbohydrate was hydrolysed with acid and the absorbance was read in spectrophotometer at the specific wave length of 470 nm. The percentage of carbohydrate was done simply by subtracting the total percentage of protein, fat, moisture and ash from 100. The equation below was used to determine the amount of carbohydrate:

Carbohydrate =100-% of (protein+ fat+ Moisture+ Ash)

Ash

Ash content was determined by igniting the sample for 12 hr in a furnace at (550-600) °C. For vitamin A content, total carotenoids content was determine using the Harvest Plus method and the absorbance of the carotenoids was read in spectrophotometer at the specific wave length of 450 nm (AOAC, 1990).

Moisture Content Analysis

Moisture content of fish fillets was determined according to Association of Official Analytical Chemists (AOAC, 1990). The samples were dried in moisture dish in an oven at 105 ˚C until constant weights is obtained.

NitrogenFreeExtract(NFE)

NFE is determined by mathematical calculation. It is obtained by subtracting the sum of percentages of all the nutrients already determined from 100. (AOAC, 1990)

%NFE=100-(%moisture+%CF+%CP+%EE+%Ash)

Statistical Analyses

The dry weight data obtained from the proximate analyses were subjected to one-way ANOVA using SPSS version 23 where significance differences were observed. DMRT was used to separate the means. All analyses are at $P<0.05$.

RESULT

The mean proximate composition of the three species caught in Zobe dam, (*Oreochromis niloticus*, *Bagrus bayad*, and *Clarias gariepinus*) are shown in Table 1. Dry matter was found to be higher in *Oreochromis niloticus* (96.92±0.49) followed by *Clarias* (96.02±0.48) then *Bagrus bayad* (95.47±0.44), crude protein ranged from the highest (*Clarias gariepinus*) with a mean value of (54.97±14.34) followed by *Bagrus bayad* (54.19±9.63) and then finally *Oreochromis niloticus* (53.57±4.63). Crude fiber, was also found to be higher in *Bagrus bayad* (0.85±0.50) with Clarias *gariepinus* having (0.83±0.65) and then *Oreochromisniloticus* having the lowest (0.83±0.10). Nitrogen free extract was however higher in *Clarias gariepinus* (30.56±8.07) then *Oreochromisniloticus* (26.02±9.03) and *bagrus bayad* having the least (20.55±12.22). The result also showed that ash content was higher in *Bagrus bayad* (20.77±1.98) and *Oreochromis niloticus* (15.61±0.50 whereas the lowest value was recorded in *Clarias gariepinus* to be the lowest (11.3±3.43) However, fat content showed significant difference ($P<0.05$) with as*Clariasgariepinus* having the highest value (4.03±0.75) followed by *Bagrus bayad* (3.36±0.90) and then *Oreochromis niloticus* (2.87±0.95) Table 1.

Table 1: Proximate Analyses Results for *Oreochromis niloticus*, *Bagrus bayad* and *Clarias gariepinus*

Parameters	*Oreochromis niloticus*	*Bagrus bayad*	*Clarias gariepinus*
DM	96.92±0.49	95.47±0.44	96.02±0.48
CP	53.57±4.63	54.19±9.63	54.97±14.34
CF	0.83±0.10	0.85±0.50	0.83±0.65
FAT	2.87 ± 0.95^{c}	3.36 ± 0.90^{b}	4.03 ± 0.75^{a}
ASH	15.61±0.50	20.77±1.98	11.03±3.43
NFE	26.02±9.03	20.55±12.22	30.56±8.07

Mean±SE with same superscripts across rows are not significantly different.

Key: DM=Dry Matter, CP=Crude Protein, CF=Crude Fibre, NFE=Nitrogen Free Extract.

DISCUSSION

The proximate analysis of fish is an important tool for fisheries managers as it provide useful information to the nutritionists, producers/culturists and processors on how to ensure that the finest quality in terms of nutrients, flavor, colour, odour and texture are obtained with attendant consumer safety (Odiko and Idogun 2015).The proximate composition of nutrients in all fish samples examined in the present study showed variation among the individual species though not significant except in fat

content. *Clarias gariepinus* was found to have the highest CP value, this high protein content of *Clarias gariepinus* may be attributed to the fact that they are omnivorous fish and known to feed on insect, small aquatic invertebrates, fish, detritus, and other aquatic plants and animals. Abdullahi (2001) reported that the protein content in fish vary with species due to certain factors such as the season of the year, mode of feeding, effect of spawning, migration and food availability. However, despite these variations, the range of protein content found in this study indicates that these species of fishes are good sources of protein to consumers.

Ash is a measure of the mineral content of food items. It is the inorganic residue that remains after the organic matter has been burnt off (Adewumi *et al.,* 2014). The range of ash in this study suggests that these species of fishes are good source of minerals such as calcium, potassium, zinc, iron and magnesium. Crude ash content varied little between species and was low in comparison with the findings of Pirestani (2010) and Nurnadia *et al.* (2011), who reported values of up to 3.3%.

According to Ackman (1989), fish can be grouped into four categories according to their fat content: lean fish (< 2 %), low fat (2 to 4 %), medium fat (4 to 8%), and high fat (> 8%). From the present study, it can be deduced that *Oreochromis niloticusand Bagrus Bayad* are low fat fish, while *Clarias gariepinus* can be classified as a high fat fish. This indicates that *Clarais gariepinus* are better sources of lipid in the body when consumed. Udo (2012) equallyreported high values of fat for *Heterobranchus longifilis*, *Clarias gariepinus* and *Chrysichthys nigrodigitatus* in the Cross River lagoon.

Nitrogen free extract value recorded in this study for *Oreochromis niliticus* are similar to the findings of Oyelese (2006) who reported nitrogen free extract value of 8.65 to 54.11 g/100 g. Other authors such as Onyia *et al*. (2010) also reported nitrogen free extract value of 1.50 to 46.02 g/100 g in *Oreochromi niloticus.* However, in the current study Nitrogen free extract was higher in *C. gariepinus* (30.56±8.07), it is based on that the fishes used in the study were ranked in the following order: *Clarias gariepinus* <*Oreochromis niloticus* <*Bagrus bayad.* The crude fibre value of 0.62 to 5.08 g/100 g was low in comparison with the value of 3.42 to 14.38 g/100 g of crude fibre reported for *O. niloticus* byFawole *et al.* (2007).

CONCLUSION

The study revealed that *Bagrus bayad*, *Oreochromis niloticus*, and *Clarias gariepinus* are rich in protein, minerals and have average to low lipid contents. This study also showed that these fish species from Zobe dam, are good sources of nutrients to the consumers and within the limits required by the body for healthy growth and development.

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