Comparison of Proximate Composition and Mineral Contents of *Citharinus Citharus* and *Mormyrus Rume* from Upper River Benue

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Abstract

The study investigated the proximate composition and mineral contents of *Citharinus citharinus* and *Mormyrus rume.* A total number of five fish each from the different fish were collected from Upper River Benue Yola in Adamawa State, Nigeria and analyzed using Atomic Adsorption Spectrophotometry. The results revealed significant differences in the proximate composition and mineral contents of the two species. *C. citharinus* had higher values of crude lipid (20.85±0.476), dry matter (94.4±0.089) and ash (92.32±0.147) and *M.* rume had higher crude protein (40.74±0.315), moisture (6.5±0.358), crude fibre (51.22±0.741 and NFE (103.52±0.956). In all the mineral contents *M. rume* had higher concentrations in Na (2.23±0.012), Ca (38.5±0.035), Mg (2.48±0.012), Fe (6.0±0.016) and Zn (1.02±0.012 compared to *M. rume* (1.87±0.008, 13.30±0.237, 2.27±0.012, 4.10±0.089 and 0.965±0.014). There were significant differences ($p<0.05$) in the mineral contents. The findings could be used as a potential source of essential protein, fat and minerals for human consumption. The result can also be used to develop policies for ensuring the sustainability of Fisheries resources.

Keywords: *Proximate composition, Minerals, C. citharus, M. rume*

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Background to the Study

Fish serves as part of our daily meal and a major protein source for both rural and urban communities. This therefore necessitate the need to ascertain the nutritional composition of commonly consumed fish species. Knowledge of this will help the consumer make a better choice of consumption based on their nutritional needs and enhance the planning of the most appropriate industrial and commercial processing method. Determination of some proximate profiles in fish like protein content, lipid, ash, nitrogen free extracts 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 presents 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 (Tilinti *et al.,*2023). 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. Moreover, fish muscle and bones are good source of calcium and phosphorus and also essential minerals, such as iron, zinc, iodine, magnesium, and potassium (Adelakun *et al.,*2021 and Nurnada *et al.,* 2013). Minerals are essential for human health as they play many important body functions such as maintain acid–base balance, haemoglobin formation, regulate the body-water balance, help bones and teeth formation, and also involved in enzymatic reactions (Weyh *et al.,* 2022).

The deficiency in these principal nutritional mineral elements induces lead to a lot of malfunctioning as it reduces productivity and causes diseases such as inability of blood to clot, osteoporosis, anaemia etc. (Gharibzahedi and Jafari,2017). Fish is a valuable and easily available source of food enriched with protein, lipid, vitamins and minerals (Petricorena 2015). Considering the good proportion of essential amino acids and degree of digestibility, fish is referred to as good quality protein source (Salma El and Nizar 2015, Shaji and Hindumathy 2013 and Tenyang *et al.* 2014). Adequate consumption of protein is essential for the proper growth and development of children and energy source for adult (Vijayan *et al.* 2016). Fish lipid is a rich source of omega-3 fatty acids recommended for human health improvement and diseases prevention. The objectives of the research are to compare the proximate composition and mineral contents of the two different species.

Materials and Methods
Proximate Composition
Proximate composition of fishes was determined using AOAC methods (1990). Moisture content was measured by weighing differences before and after oven drying at 100-105°C for 16h. Lipid determination was carried out using the modified Bligh and Dyer procedure (1959), the ash content of the fish was determined by igniting the sample at 550°C for 5-6 hours until the sample was completely free from carbon particles in a carbonite muffle furnace while the total nitrogen was determined by Kjedahl method as described by AOAC, (1994) and a factor of 6.25 was used for converting the total nitrogen to crude protein of the fish sample.

Determination of Macro Elements
The following macro elements (Sodium, Calcium, Magnesium, Iron and Zinc) of the four fish samples were determined directly using Atomic Absorption Spectrophotometer (AAS) in the laboratory. This process involves the absorption by free atoms of an element of light at a wavelength specific to that element. Flame Photometer (FP 640) was used to determine Sodium (Na). Atomic Absorption spectrophotometer (AAS; BULK SCIENTIIFC) VGP-210 Mg, Ca, Fe and Zn.

Statistical Analysis
All data were analyzed by one-way ANOVA analysis using SPSS 17.0 for windows. A value of $P<0.05$ was used to indicate significant differences.

Results
The proximate composition *Citharinus citharus* and *Mormyrus rume* (Table 1) revealed that the higher crude protein, crude Fibre and NFE were in *M. rume* (40.746±315, 51.72±0.741 and 103.52±0.955) respectively than *C. citharinus*. Whereas, *C. citharus* had better crud Lipid, Ash and DM(20.85±0.476, 92.32±0.147 and 94.4±0.089) than *M. rume*. There was significant difference(p<0.05) between the proximate composition of the two species.

From Table 2, *M. rume* had higher Na, Mg, Ca, Fe and Zn (2.23±0.012, 2.48±0.012, 38.51±0.035, 6.0±0.016 and 1.02±0.012) than *C. citharus* (1.87±0.008, 2.27±0.012, 13.30±0.237, 4.10±0.089 and 0.965±0.014). There was significant difference in the mineral contents of the two fishes.

Table 1: Proximate Composition of *Citharinus citharus* and *Mormyrus rume*

Composition	*C. citharinus*	*M. rume*
Crude Protein	12.72±0.375[b]	40.746±315[a]
Crude Lipid	20.85±0.476[a]	15.72±0.232[b]
Crude Fibre	16.20±0.228[b]	51.72±0.741[a]
Moisture	5.5±0.089[b]	6.5±0.358[a]
Ash	92.32±0.147[a]	86.52±3.099[b]
DM	94.4±0.089[a]	92.57±0.771[b]
NFE	47.67±0.067[b]	103.52±0.955[a]

Means on the same row with different superscripts are significantly different(p<0.05)

Table 2: Mineral Contents of *Citharinus citharinus* and *Mormyrus rume*

Mineral Content	*C. citharinus*	*M. rume*
Na	1.87±0.008[b]	2.23±0.012[a]
Mg	2.27±0.012[b]	2.48±0.012[a]
Ca	13.30±0.237[b]	38.51±0.035[a]
Fe	4.10±0.089[b]	6.0±0.016[a]
Zn	0.965±0.014[b]	1.02±0.012[a]

Means on the same row with different superscripts are significantly different(p<0.05)

Discussion

The result of this study on the proximate composition *M. rume* showed that the crude protein is higher than what Adedeji and Ibrahim,2013 had in the same species (15.48) and lower than 59.45 obtained by Adelakun *et al.* 2021.The difference could be as a result of age, feeding and other environmental factors. The crude lipid in this present study is higher than the results of Adedeji and Ibrahim (2013) and Adelakun *et al.*,2021 that had 8.97 and 8.34 respectively. However, Ikape *et al.*2018 had higher lipid (34.0 ±0.17) than what was obtained this study.

The fibre content in this study was higher than what was obtained in Adedeji and Ibrahim (2013), Ikape *et al.*,2018 and Adelakun *et al.*,2021that obtained 8.97,7.53 and 0.02 respectively in *M. rume*. Adedeji and Ibrahim (2013 had higher moisture content (69.30) than what was observed in the present study. Ash obtain in Adelakun *et al* 2021, Adedeji and Ibrahim,2013 and Ikape *et al.*,2021 were lower compared to the result in this study. Effiong and Fakunle (2011) had very high crude protein (21.62) in *C. citharus* compared to what was obtained from the present study. Ndome *et al.*,2010 had 64.25 in the same species which far higher than the result from this study. The lipid content in Ndome *et al.* 2010 (24.60) was higher than what was observed in this study. However, the lipid obtained in this study was higher than what was reported by Effiong and Fakunle, 2011(5.12). The moisture content obtained from the work of Effiong and Fakunle(2011) and Ikape *et al.* 2018 were higher than what was obtained in this research. These however, could be due to the feeding, age of the species and environmental factors in the different water bodies. It is noteworthy to state that both Ash and dry mater contents in this study were higher than the reports of the authors in *C. citharus.*

Looking at the results of the two fish species studied in this work mineral contents, *M. rume* had better Calcium, Zinc, Iron Magnesium and Sodium. Showing that *M. rume* could be recommended for children and nursing mothers. Fe is an important element that forms part of haemoglobin, that enable Oxygen to be carried from the lungs to the tissue (Landis and Yu, 1995). The level of Fe recorded in this study is lower than what was   by Adelakun *et al.*,2021 and Kehinde and Adelakun (2019) in some freshwater fish from some markets from New Bussa and River Oli, a major river that flow through New Bussa and its environs. Fish is packed with protein, vitamins, and nutrients that can lower blood pressure and help reduce the risk of a heart attack or stroke (Piepoli *et al.*,2016, Raatz *et al.*, 2013, Torris *et al.*,2018).

From this study, *M. rume* has high fat content and consequently Omega 3. Omega-3 fatty acids are found in every kind of fish, but are especially high in fatty fish (Tilinti *et al.*,2023). According to these authors, eating these essential nutrients keep our heart and brain healthy. Omega 3 fatty acids from fish is beneficial to women of reproductive age, prevent cardiovascular disease (Strom *et al.*,2012), checkmate arterial blood pressure and blood glucose levels in elderly people (Ponagiotakos *et al.*,2007).

Conclusion

The study has revealed the rich nutrients in both *M. rume* and *C. citharus* that are essential for human health. *M. rume* contains all the nutrient contents examined in this study with very high crude protein level. This therefore, classify the fish for constant consumption in rural and urban communities.

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