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Comparison of Microbiological and Proximate Analysis of *Synodontis nigrita*, *Chrysichthys nigrodigitatus* and *Mormyrus rume* in Olomore Market, Abeokuta, Ogun State, Nigeria

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ABSTRACT

The study was carried out to compare the microbiological and proximate analysis of fresh *Synodontis nigrita, Mormyrus rume* and *Chrysichthys nigrodigitatus* sold at Olomore market Abeokuta Ogun State. The results show no significant difference in moisture content of *Chrysichthys nigrodigitatus* (70.99±1.09%), *Mormyrus rume* (67.30±4.08%) and *Synodontis nigrita* (67.33±1.99%). The crude protein content of *Chrysichthys nigrodigitatus* (12.10±0.74%), *Mormyrus rume* (15.48±1.63%) and *Synodontis nigrita* (10.73±0.61%) were measured. The carbohydrate content of *Chrysichthys nigrodigitatus* (1.15±0.13%), *Mormyrus rume* (2.09±0.20%) and *Synodontis nigrita* (2.04±0.10%) were also measured. Fat content of *Chrysichthys nigrodigitatus* (7.15±1.29%) *Mormyrus rume* (8.97±1.9%) and *Synodontis nigrita* (8.62±0.89%) and for ash content of *Chrysichthys nigrodigitatus* (6.33±0.69%), *Mormyrus rume* (4.89±0.21%) and *Synodontis nigrita* (8.85±0.27%) were also calculated. For crude protein there was significant different ($p<0.05$) same with fat content, ash content and carbohydrate content ($p<0.05$) unlike moisture content and dry matter content which is 28.57±1.55, 32.50±4.08 and 32.67±1.99% in species analyses. Result showed total bacteria count 1.9-3.8×10^6 CUF mL^{-1} from *C. nigrodigitatus* while 2.8-4.7×10^6 CUF mL^{-1} was obtained for *S. nigrita* and 2.6-3.8×10^6 CFU mL^{-1} for *M. rume*. The micro-organism isolated were *Pseudomonas* sp., *Escherichia* sp., *Klebsiella* sp., *Staphylococcus* sp., *Proteeus* sp. and *Micrococcus* sp. On biochemical characterisation the following bacteria was isolated *Pseudomonas* sp., *Escherichia* sp., *Klebsiella* sp., *Staphylococcus* sp., *Proteus* sp. and *Micrococcus* sp.

Key words: Microbiological, proximate analysis, fish safety, nutrients

INTRODUCTION

Fish and fish product constitute more than 60% of the total protein intake in adults especially in the rural areas. They are widely accepted on the menu card and form a much-cherished delicacy that cuts across economic, religious and educational barriers (Adeleye, 1992). Fish is a major source of protein and its harvesting, handling, processing and distribution provide livelihood for millions of people. It is a most important animal dietary protein available in the World and it represents about 14% of all animal protein on a global basis (Abolagba and Mella, 2008).

Fish is regarded as healthier meat option due to the high content of Long Chain Poly Unsaturated Fatty Acids (LCPUFA's) which are associated with improving health and preventing

disease of old age (Kabaherda *et al*., 2009). In Nigeria, fish constitutes 40% of animal protein intake. Infact, Ames *et al*. (1991) reported that fish represents a significant proportion between 30-80% of total annual protein in the diet of consumers either as fresh or cured fish is a particularly important protein sources in regions where livestock is relatively scarce. In Nigeria, fish is eaten fresh, preserved or processed (smoked) and form a much-cherished delicacy that cut across socio-economic, age, religious and educational barriers (Adebayo-Tayo *et al*., 2008).

In Nigeria, the fisher folks and sellers of aquatic products neglect the importance of hygiene practice on these products by exposing them to all sorts of pathogens in the markets place where consumers purchase and consume mostly without further processing such as washing, cooking or heating. Microbial contamination could also be due to unhygienic conditions in harvest areas like open poultry manure industrial effluents and sewage disposal into the water bodies in which fish inhabit.

MATERIALS AND METHODS

The samples were collected from Olomore market, Abeokuta, Ogun State, Nigeria. A total of 9 samples which comprised of 3 different species of *Synodontis nigrita*, *Chrysichthys nigrodigitatus* and *Mormyrus rume* were purchased and collected in a sterile aluminum foil and the samples were transported to the microbiology laboratory in a well covered ice cooler for analysis and these samples were labeled G1, L1, I1, G2, L2, I2, G3, L3, I3. A sterile dissecting blade was used to dissect the fish to get the gill, liver and intestine of the fish of different species in a sterile container and analyzed immediately. The materials needed for this experiment include glasswares (conical flasks, micro pipettes, test tube, petri dishes) and they were washed with detergents.

RESULTS

The present study was carried out to know the proximate composition weight of fresh fish *Chrysichthys nigrodigitatus*, *Mormyrus rume* and *Synodontis nigrita* (Table 1), the proximate composition total bacteria count and Biochemical test of the bacteria isolated from the fresh fish samples obtained from Olomore market, Abeokuta, Ogun State.

DISCUSSION

The proximate composition of the fish samples *Chrysichthys nigrodigitatus*, *Mormyrus rume* and *Synodontis nigrita* ranged from 67.30±4.08 to 70.99±1.09% (Table 1). The moisture content was within previously reported range in other fish species (Osibona *et al*., 2006). Usually moisture and lipid contents in fish fillets are inversely related and their sum was approximately 80% (FAO., 1995). However, this value was compared and there was no significant difference ($p>0.05$). The value of ash was higher in *Synodontis nigrita* (8.85±0.27%) than *Mormyrus rume* (4.89±0.21%) *Chrysichthys nigrodigitatus* (6.23±0.69%). For the fat content of *Chrysichthys nigrodigitatus*,

Table 1: Proximate composition weight of fresh *Chrysichthys nigrodigitatus*, *Mormyrus rume* and *Synodontis nigrita* from Olomore market

Composition (%)	*Chrysichthys nigrodigitatus*	*Mormyrus rume*	*Synodontis nigrita*
Moisture	70.99±1.09^{a}	67.30±4.08^{a}	67.33±1.99^{a}
Crude protein	12.10±0.74^{a,b}	15.48±1.63^{b}	10.73±0.61^{a}
Crude fat	7.15±1.29^{b}	8.97±1.90^{b}	8.62±0.89^{b}
Ash	6.23±0.69^{a}	4.89±0.21^{a}	8.85±0.27^{b}
Crude carbohydrate	1.15±0.13^{a}	2.09±0.20^{b}	2.04±0.10^{b}

Mean value in the same column with the same superscripts are not significantly different at $p<0.05$

and *Mormyrus rume* and *Synodontis nigrita* ranged from 7.15±1.29 to 8.97±1.90%. The higher concentration of the fat content is usually an indication of a high eating and processing quality. The lipid level in the fish tissue is definitely due to the influence of food (Onyia *et al*., 2007). The crude carbohydrate values ranged from 1.15±0.13 to 2.09±0.20%. There was significant difference ($p<0.05$) between them. The proximate composition of the fish samples revealed crude protein contents ranges from 10.73±0.61 to 15.48±1.63%. The concentration of the crude protein content were within the ranges previously reported for *C. gariepinus* and other fishes (Murray and Burt, 1991; Afolabi *et al*., 1984; Eyo, 2001; Osibona *et al*., 2006; Onyia *et al*., 2007). For crude fibre content the values ranges 1.28±0.15 to 2.44±0.13% and there was significant difference ($p<0.05$) between them.

This shows the pathogenic bacteria that are present in the organs of the fresh fish in Olomore market, Abeokuta. The total count (CFU mL^{-1}) of bacteria and fungi present in the organs of fresh fish *Chrysichthys nigrodigitatus*, *Mormyrus rume* and *Synodontis nigrita* were analysed. The total bacteria evaluated for *C. nigrodigitatus* was 1.9-3.8×10^6, *S. nigrita* was 2.8-4.7×10^6 and *M. rume* was 2.6-3.8×10^6 as represented in Fig. 1. According to International Commission on Microbiological Specification for Food (ICMSF., 1998), the maximum recommended bacteria count for good quality product was 5.0×10^5 (5.710 g CFU mL^{-1}) and the maximum for marginal acceptable quality products is 1.0×10^7 (710 g CFU mL^{-1}). The bacteria load obtained from the fresh fish *C. nigrodigitatus*, *S. nigrita* and *M. rume* obtained from Olomore market were higher than the recommended values. Therefore, the fish were not suitable for human consumption. Moreover, the presence of organism could be as a result of handling during fishing and transportation to the market place.

However, Table 2 shows different types of bacteria isolated and identified from the organs of the fish samples *Chrysichthys nigrodigitatus*, *Synodontis nigrita* and *Mormyrus rume* (analysed). Bacteria family included *Pseudomonas* sp. and *Staphylococcus* sp. were dominated and the samples followed by *Escherichia* sp., *Klebsiella* sp., *Micrococcus* sp. and *Proteus* sp. which occurred least in the samples. The bacteria group of *Staphylococcus* sp. according to Robert (2012) was one of the most common cause of human disease and they constitute the normal flora of the human skin and mucous membrane without resulting in a diseased condition. Thus, the bacteria class may also cause superficial systemic infections such as boils, impetigo and folliculitis while more serious and more common infections could be pneumonia, bacteremia and other infections of the bones and wounds.

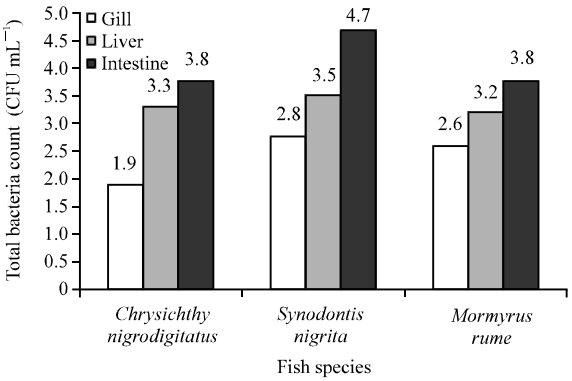

Fig. 1: Total bacteria count in the fresh fish from Olomore market

Table 2: Biochemical test of the bacteria isolated from the fish samples

Label	Grain	Motility	Glucose	Lactose	Manitol	Maltose	Indole	Methyl red	Voges proskauer	Isolate
A	-	+	+	-	+	+	-	+	+	*Pseudomonas* sp.
B	-	+	+	+	+	+	+	+	-	*Pseudomonas* sp.
C	-	-	+	+	+	+	-	-	-	*Klebsiella* sp.
D	+	-	+	+	+	+	NA	+	-	*Staphylococcus* sp.
E	-	+	+	-	-	-	-	+	-	*Proteus* sp.
F	+	-	+	+	+	+	NA	+	-	*Micrococcus* sp.
G	-	+	+	+	+	+	-	+	-	*Citrobacter* sp.

Label	Citrare	H_2S	Sucrose	Urea	Oxidase	Coagulase	Catalase	Isolate
A	+	+	+	+	+	NA	+	*Pseudomonas* sp.
B	-	-	NA	-	-	NA	+	*Escherichia* sp.
C	+	-	+	-	-	-	+	*Klebsiella* sp.
D	+	-	+	+	-	-	+	*Staphylococcus* sp.
E	+	+	+	+	-	+	+	*Proteus* sp.
F	NA	NA	+	NA	+	-	+	*Micrococcus* sp.
G	+	+	-	-	-	-	+	*Citrobacter* sp.

Venugopal (2002) had observed that incidence contamination of fish particularly by pathogens may occur prior to harvest during capture, processing and distribution. Huss *et al.* (2000) had pointed out that some pathogenic bacteria are naturally present in the aquatic (*Clostridium botulinum* type E, pathogenic vibro sp., Aeromonas) and the general environment (*C. botulinum*, type A and *Listeria monocytogenes*) may therefore, be found on live or raw fish. Many studies such as the one conducted by Montville *et al.* (2002) have similarly concluded that, during handling and preparation, bacteria may be transferred from contaminated hands of food workers to food and subsequently to other surfaces. Synder (1998) also found that low infectious doses from organisms such as *Shigella* and the *E. coli* were linked to hands as a source of contamination. Other studies done by Reij and Den Aantrekker (2004) had identified equipment as a major source of microbial contamination. With the value reported in this report, it is therefore suggested that consumers should be educated about the adverse effects of using untreated water or polluted water for processing, as these could serve as sources of microbial contamination. However, the processors/handlers/sellers should observe strict hygienic measures so that they will not serve as a source of chance inoculation of microorganisms.

CONCLUSION

The nutrient composition showed that there was higher moisture content and least carbohydrate content in fresh fishes of *Chrysichthys nigrodigitatus*, *Synodontis nigrita* and *Mormyrus rume* gotten from Olomore market in Abeokuta, Ogun State. The present study shown that there was high microbial load in fresh fishes gotten from Olomore market, also that the fresh fish available in some of our markets contain some micro-organisms and this has effects on the human health. The market environment determines the microbiological quality of fresh fish and handling are factor responsible for the contamination of fresh fish in the markets. However, the following are hereby recommended:

- Handling, processing and preservation of the fresh fish must be hygienically obtained
- Consumers of fresh fish should wash and subject these products to further cooking or heating so as to deactivate all heat labile microorganisms present

- The appropriate authority such as Federal Department of Fisheries (FDF), Ministry of Agriculture and other relevant agencies responsible for food safety and hygiene should ensure compliance with public health and hygienic procedures

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