SEASONAL VARIATIONS IN THE PROXIMATE COMPOSITION OF NURSE TETRA (*BRYCINUS NURSE*) FROM ALAU LAKE MAIDUGURI, NIGERIA

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ABSTRACT

This study was conducted to investigate the proximate composition of Brycinus nurse from Alau Lake in Maiduguri, Nigeria at different periods of the year (wet season, dry season and harmattan periods). The moisture, protein, fat and ash contents, crude fibre and dry matter were determined using the international accepted methods of AOAC for the analysis. The average moisture content for periods varied from 62.50 to 71.36 % with wet season having the highest value followed by harmattan period and least in dry season. The protein content ranges from 14.00 to 32.56 % with dry season with the highest value, followed by harmattan period and wet season had the least value. The fat content for harmattan period was 40.00 % as the highest followed by wet season 23.00 % and least in dry season 10.00%. The ash content wet season 1.5% was the highest value and dry season and harmattan period I.0 % was least. Crude fibre was highest in harmattan period 45.00 %, followed by dry season 29.00 % and wet season was least at 23.00 %. Dry matter was highest in dry season 37.50 %, followed by harmattan period 36.68 % and wet season had the least value of 28.00 %. However, statistical analysis showed no significant difference at p<0.05 level of significance. Conclusively, the period of year has effect on the proximate composition of Brycinus nurse in Alau Lake.

Keywords: Moisture, Protein, Ash, Season, Rainy, Heat, Harmattan, Nurse tetra, Alau Lake, Maiduguri

INTRODUCTION

Fishes are greatly perishable but very important foodstuff, especially in third world countries, due to its high protein content and its affordability when compared with beef or pork (Edem, 2009). Fishes are known to provide protein, fat and vitamins which are of great benefit to human health (Job *et al*., 2015). The nature and quality of nutrients in most animals is dependent upon their food type. Fish is a highly perishable commodity, deterioration set in some few hours after being caught depending on the specie and the prevailing ambient temperature. This may render it unacceptable and unfit for human consumption. Proper preservation starts the moment it is harvested until it reaches the consumer's table (Oluborode *et al.,* 2010). Preservation techniques are needed to prevent fish spoilage and lengthen shelf life (Ananou *et al*., 2007). They are assigned to inhibit the activity of spoilage bacteria and the metabolic change that result in the loss of fish quality (Ananou *et al*., 2007). Fish provides 22 % of the protein intake in sub-Saharan Africa (FAO, 2003). Fish protein is of high quality since it has an almost ideal proportion of essential amino acids. The protein in fish is easily digestible, as it contains less collagen fibre than the protein found in meat;

this helps the body to maximally utilize its protein. The fats found in fish contain unsaturated fatty acids which do not pose a threat to the heart as they help reduce blood triglycerides (Pamploner-Roger, 2006). Foran *et al.* (2005) reported that fish is a proteinous food consumed by a larger percentage of populace because of its availability and palatability. However, information on proximate composition of some fish species is scanty. Thus, there is need to study the proximate composition of such fish species. This study, therefore aimed at the seasonal variation on the proximate composition of nurse tetra (*Brycinus nurse*) from Alau Lake Maiduguri, Nigeria.

MATERIALS AND METHODS

Study Area: This study was carried in Maiduguri in the Northeastern zone of Nigeria. The fish species, *Brycinus nurse* used for this study was procured from Alau Lake. Alau Lake is the second largest lake in Borno State, Northeastern Nigeria. It is located between latitude 12^0N and 13^0N and longitude 11^0E and 13^0E with total surface area of 56 km. The climate is sahelian with two distinct seasons. A wet season starting from June to September, with a mean rainfall of about 600 mm, with a dry harmattan period preceding the rainy season from October to February. The dry season spans from March to May characterized by intense heat, temperature range of 46 – 48°C has been recorded in this period (Idowu *et al.*, 2004). The lake is a natural water storage formed by Nggada River and it is characterized by a charming, undulating landscape, which is further beautified by savannah vegetation with sparking shores around it. The sampled fish between January and November 2015 was identified using standard taxonomical key (Fish Base, 2012).

Proximate Analysis: The proximate composition of the fish was determined according to the AOAC (2006). The moisture content of the sample is lost by volatilization caused by heat. The amount of materials left after the removal of moisture is the dry matter. High temperature drying can cause volatile components of the sample to be lost or sample characteristics. This was done using a forced air oven at 105^oC first for five hours and then repeated for 30 minutes interval until a constant weight was obtained. The loss in weight was calculated as the moisture content. The protein content of each fish was assayed by the micro-Kjeldahl method as reported by AOAC (2006). The gram of nitrogen obtained was multiplied by the factor of 6.25 to obtain the protein content of each fish sample. The ash content of respective sample was determined by dry-ashing the samples at 550^oC for 24 hours. Fat was quantified using the procedure of AOAC (2006) with n-hexane (68.5 – 69.1^oC) as solvent.

Statistical Analysis: All samples were analysed in triplicates and data were subjected to one-way analysis of variance (ANOVA). Post hoc analysis was done by the use of Duncan's Multiple Range Test and means were separated at $p<0.05$ using the Statistical Package for Social Scientists computer software package (IBM, 2012).

RESULTS AND DISCUSSION

The moisture content of the fish sample for the various period of the year was presented in Figure 1.

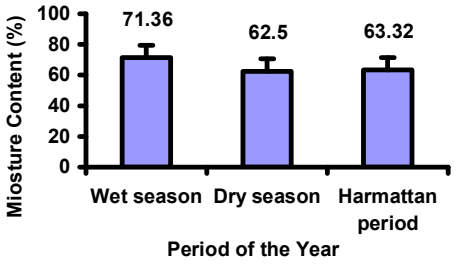

Figure 1: Seasonal variation in percentage moisture content of *Brycinus nurse* from Alau Lake Maiduguri, Nigeria

The highest moisture content was recorded in the wet season as 71.36 %, followed by harmattan period 63.32 % and least in dry season 62.50 %. The protein content of sample fish for the seasons ranged from 13.21 % to 32.56 % as presented in Figure 2. These values indicate that the fish is of high protein source.

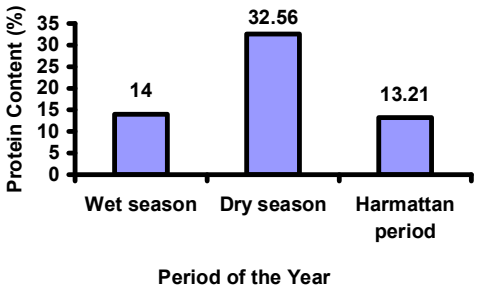

Figure 2: Seasonal variation in percentage protein content of *Brycinus nurse* from Alau Lake Maiduguri, Nigeria

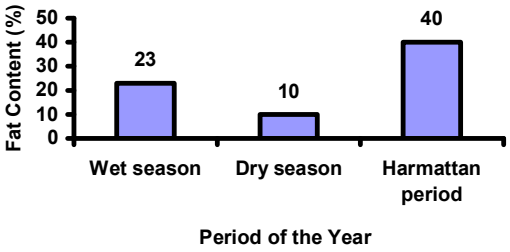

Figure 3: Seasonal variation in percentage fat content of *Brycinus nurse* from Alau Lake Maiduguri, Nigeria

The fat content as presented in Figure 3 varied with season. The highest value was at harmattan period followed by wet season and least at dry season, so the fish can be referred to as oily or fatty fish. The ash contents as represented in Figure 4, were generally low, which ranged (1.0 – 1.5 %). The crude fibre as represented in Figure 5, with wet season having 23 % as least, followed by dry season 29 % and highest value 45 % in harmattan period.

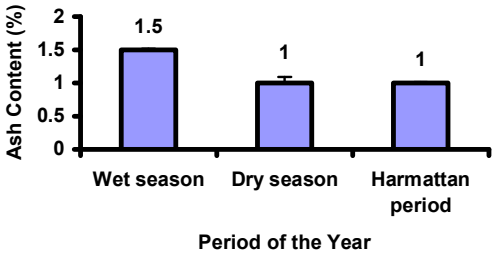

Figure 4: Seasonal variation in percentage ash content of *Brycinus nurse* from Alau Lake Maiduguri, Nigeria

The dry matter was represented in Figure 6, with wet season having 28.64 % as least, followed by 36.68 % in harmattan period and highest value in dry season 37.5 %. The results of the moisture content obtained in this study disagree with work of (Abdullahi, 2001; Effiong and Tafa, 2005; Effiong and Mohammed, 2008) in which, higher moisture content were reported in other freshwater species. It also negates FAO (2010) and USDA (2010) permissible limits for fish and fisheries products of 78 – 90 %.

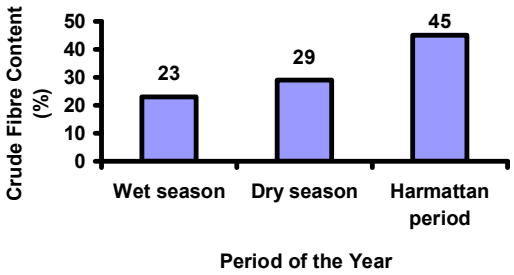

Figure 5: Seasonal variation in percentage crude fibre content of *Brycinus nurse* from Alau Lake Maiduguri, Nigeria

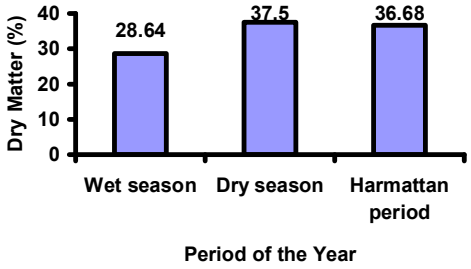

Figure 6: Seasonal variation in percentage dry matter of *Brycinus nurse* from Alau Lake Maiduguri, Nigeria

The protein content finding was similar to that reported by Mumba and Jose (2005). The values were higher than those reported in beef, pork, lamb, mackerel and oyster (Eyo, 2001). Abdullahi (2001) reported that the protein content in fish might vary with species due to certain factors such as the season of the year, effect of spawning and migration, food available etc. as observed during the dry season. The values during the wet season and the harmattan period, agreed with work of Gokoglu *et al.* (2004) who reported that 19.8 – 29.0 % for rainbow trout (*Onchorhynchus mykiss*) subjected to various cooking methods. Palani *et al.* (2014) reported that the protein content of fatty fishes that landed in the Thoothukudi coast of India was 14 %. Amounts of protein in five

species of marine fish consumed in Gabon ranged from 16 % to 20 % (Ondo-azi *et al*., 2013).

Fat content levels agreed with the work of (Akpambang, 2015). Fish oil is known to contain polyunsaturated fatty acids, which help to fight coronary heart diseases (Yang *et al*., 2013).

Ash content obtained from the study, closely agrees with values obtained by (Akpambang, 2015). As reported by Effiong and Mohammed (2008), the ash content of dry and wet samples of *Citharinus citharus, Clarias anguillaris* and *Hemisynodontis membranaceus* were generally low (0.40 – 1.35 %). Gokoglu *et al.* (2004) reported ash values (1.35 – 1.66 %) obtained in rainbow trout. It is also in line with the values of 0.95 – 2.50 % reported for silver catfish by Weber *et al.* (2008) but lower than 2.5 – 6.25 % obtained in raw mince of *Catla* fish species from India (Vanitha *et al.,* 2013).

The results on the crude fibre did not agree with the work of Akpambang (2015) that, in the dry season samples the crude fiber was negligible. For the wet season sample, crude fiber had a range of 0.68 – 0.90 %. Negligible amounts of this nutrient have been reported by other authors (Oladele *et al*., 2005; Effiong and Tafa, 2005).

The dry matter values was lower than values reported by Thompson *et al*. (2008) that, digestibility ranged from a low of 64.22 % to a high of 79.17 % for the three test ingredients.

Seasonal variation in proximate composition of *B. nurse* caught from Alau Lake for the different period of the year. There was significant difference ($p<0.05$) between the period of the year, moisture, protein, fat, ash contents, crude fibre and dry matter. It is therefore, recommended that seasonal variations on the proximate composition of other fish species should be investigated.

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