PROXIMATE AND CHEMICAL COMPOSITION OF CLARIAS GARIEPINUS FED HIBISCUS SABDARIFFA MEAL DIETS

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ABSTRACT

The use of medicinal plants that can enhancement of immunity eases of stress through its richness in antioxidant and stimulating effects on appetite and performance is a well –known facts based on the diverse array of phytomolecules. The qualities and quantities of food products is now a serious concern to the consumers in term of its hygiene and safety, Therefore, the effect of graded levels of *Hibiscus sabdariffa* meal diets on the proximate and mineral composition of *Clarias gariepinus* were evaluated after feeding for 84days. The effect of *H. sabdariffa* on the carcass composition of *C. gariepinus* showed that the moisture, protein, lipid, ash and NFE did not vary significantly ($p<0.05$) within the tested groups and the control, but the crude fibre contents varied significantly as the increasing concentration of *H.sabdariffa*. The results revealed that the highest phosphorous and magnesium values (0.35±0.02; 2.78±0.05*) were from the fish carcasses fed HSM1 and HSM5 diets and the lowest values (2.50±0.08; 0.30±0.02) were from the carcass fed HSM2 and HSM1diets respectively. Carcass quality of African catfish fed *H. sabdariffa* was not compromised.

INTRODUCTION

Nutritional quality of a feed is influenced not only by nutrient contents but also by many other aspects such as feed presentation, hygiene, palatability and effect on intestinal health. Feed additives provide a mechanism by which such dietary deficiencies can be addressed, which benefits not only the nutrition and thus the growth rate of the animal concerned but also its health and welfare (Fefena, 2007) and higher profitability (Adewole**,** 2014). The qualities and quantities of food products is now a serious concern to the consumers in term of its hygiene and safety, in the process of meeting these demands, there is need for intensification of the husbandry processes which has the resultant effects of inducing stress. This has led to the use of antibiotics and other drugs that have been known to have untold consequences on the health of the animals and human respectively. Therefore, there is the need to seek for alternative non conventional resources that is as effective and with health proven benefits. *H. sabdariffa* (locally called Zobo) is very rich in its nutritional and medicinal profile and have been reported to be effective in blood pressure management, hepatoprotection, anti-cancer, anti-inflammation, antibacterial and improvement of digestion due to the presence of vitamins, minerals and flavonoids. Its utilization as dietary additive in fish production and economic advantages has been reported (Adewole, 2018). This study therefore seeks the effect of *H. sabdariffa* meal diets on the proximate and chemical composition of *C. gariepinus*.

MATERIALS AND METHODS:

STUDY LOCATION: The study was carried out at the Department of Aquaculture and Fisheries Management's Teaching and Research Laboratory, University of Ibadan, Ibadan, Nigeria.
EXPERIMENTAL PROCEDURES: Collection and identification of plant material, preparation and processing of Roselle Calyx (*H. sabdariffa)* and calculated dosage values were based on (Adewole, 2018; 2014).

FORMULATION OF EXPERIMENTAL DIETS AND EXPERIMENTAL DESIGN:

Six isonitrogenous diet (40% crude protein) were formulated using algebraic method along the least cost formulae and coded as HSM1 (Control), HSM2, HSM3, HSM4, HSM5 and HSM6 respectively. A Completely Randomized Block Design was used to the design of the experiment. Twenty juvenile *C. gariepinus* of initial mean weight and length: 10.94±0.02g and 10.28±0.04cm respectively were stocked in triplicates per treatments, fed twice daily at 5% body weight, for 12 weeks (Adewole, 2018; 2014).

PROXIMATE ANALYSIS AND MINERAL COMPOSITION:

Proximate composition of the fish were carried out according to AOAC (2005), while the mineral elements were determined using Atomic Absorption Spectrophotometer (AAS-Buck 205 model). Flame photometer was used for the determination of sodium and potassium ions (Sogbesan, 2007).

DATA ANALYSIS:

Analysis of Variance (ANOVA) at (α0.05) and significant treatment means compared using Duncan Multiple Range Test (SAS, 1999).

RESULTS

The final carcass moisture contents ranged from 73.40 ± 0.85 to 76.33 ± 0.26%. The highest final moisture value was from the fish fed the control (HSM1) diet and the lowest value was from the fish fed HSM2 diet. Within the treatments, there was no significant difference (P>0.05) in the moisture contents of fish fed the experimental diets (Table 1).The final carcass crude protein content varied from 65.26 ± 1.1 to 68.07 ± 2.00%. The highest final crude protein value was from the fish fed HSM5 diet and the lowest crude protein value was from the fish fed the control diet. Within the treatments, the flesh of the fish fed the control diet was insignificantly lower (p<0.05) in the crude protein contents compared to the flesh from fish fed other diets (Table 1). The final carcass crude lipid contents ranged from 9.63 ± 0.02 to 10.16 ± 0.36%. The highest crude lipid value was from fish flesh fed the HSM2 diet, while the lowest crude lipid was from the fish flesh fed HSM1 diet. Within the treatments, the fish flesh fed the control diet was insignificantly lower (P<0.05) in the final crude lipid contents compared to the fish flesh fed other diets (Table 1). The final carcass crude fiber contents varied from1.32 ± 0.02 to 1.64 ± 0.03%. The highest final carcass crude fiber was from the fish fed HSM6 diet and the lowest crude fiber content was from the fish flesh fed the control diet. Within the treatments, the fish flesh fed the control diet was significantly different (P<0.05) in the final crude fiber contents compared to the fish flesh fed the other diets (Table 1). The final crude ash contents ranged from 16.72 ± 0.24% to 17.30 ± 0.17%. The highest final carcass crude ash content was from the fish fed HSM4 diet, while the lowest final crude ash content was from the fish fed HSM6 diet. Within the treatments there was no significant difference (P>0.05) in the final carcass crude ash contents between the control diet and the other treatments (Table 1). All the final protein, fibre, and ash values were higher than initial.

The mineral element Sodium ((Na^+) ion concentrations ranged from 0.71 ± 0.06 to 0.80 ± 0.04 (units). The highest Na^+ ion concentration was from the carcass of fish fed HSM4 diet and the lowest concentration was from the carcass of fish fed HSM2 diet. The final Na^+ ion concentrations were higher than the initial. Within the treatments, the fish flesh fed the control diet was insignificantly lower (p<0.05) in final Na^+ ion concentration compared to the other treatments (Table 1).The Potassium (K^+) ion concentration varied from 1.33 ± 0.01 to 1.50 ± 0.05. The highest K^+ value was from the fish flesh fed the HSM1 diet and lowest from fish flesh fed HSM2 diet. The final potassium ion concentrations were higher than the initial. Within the treatments, the fish fed the control diet had insignificantly higher (p<0.05) final potassium compared to the others (Table1).The calcium (Ca^{2+}) ions concentration ranged from 2.78 ± 0.14 to 3.34 ± 0.20. The highest Ca^{2+} ion concentration was from the carcass of the fish fed HSM3 diet and the lowest was from the fish flesh fed HSM4 diet. All

the final Ca^{2+} ion concentrations were higher than the initial. The fish flesh fed HSM3 diet had significantly ($P<0.05$) higher Ca^{2+} ions concentration than the fish flesh fed HSM4 diet, but not significantly different from the other fish fleshes (Table1). The phosphorus ion concentration varied from 2.50 ± 0.08 to 2.78 ± 0.05. The highest was from the fish fed the HSM1 diet and the lowest was from the fish fed HSM2 diets. All the final phosphorus ion concentrations were higher than the initial. Within the treatments, the fish fed the HSM1 diet was significantly higher in the final phosphorus ion concentration compared to the fish fed HSM2 diet, but not significantly different from the others (Table1).The final carcass magnesium ion concentration ranged from 0.28 ± 0.02 to 0.35 ± 0.02. The highest was from the fish fed HSM5 diet and the lowest value was from the HSM1 diet. All the final magnesium contents were higher than the initial, but otherwise for the fish fed the control diet. Within the treatment, fish fed HSM5 diet had insignificantly higher ($p<0.05$) magnesium compared to the other treatments.

DISCUSSION

The result of the feeding of the different concentrations of HSM diets on the protein content of *C. gariepinus* obtained in the present study showed numerical increase as the concentration of HSM diets increase. This is similar to the observation of (Adeparusi *et al*, 2010) fed *Oreochromics niloticus* graded levels of ginger. The slight increase in the protein composition of *C. gariepinus* in this result when compared to the control at ($p<0.05$), may be due to the improvement in liver and other organs functions which synthesized plasma protein (Metwally; 2009).The moisture contents of *C. gariepinus* fed *H. sabdariffa* meal decreased insignificantly when compared to the control, but increase as the concentration of HSM diets inclusion levels increased. This is similar to a general decrease in percentage moisture contents which decrease inversely with increasing fat content of the fish carcasses (Olukunle, 2009) and were similar to 58.60 and 80.70% (Makanjuola, 2012).For the fat composition of *C. gariepinus* there was also slight increase as the concentration of *H.sabdariffa* meal's diet increases, this is similar to the results (Adeparusi *et al*, 2010) (9.38-10.11%) fed *O. niloticus*. This may be due to higher contents of the fat contents of the diets, which increased as the concentration of HS's diet increases, hence the higher fat deposit in the body of *C. gariepinus*. The mineral electrolytes/elemental composition of *C. gariepinus* fed HSM's diet showed that Na and Mg increased insignificantly within the tested groups when compared to the control, while elements like Ca and Phosphorus decreased significantly with the increase in HSM's diet levels, while K decreased insignificantly when compared to the control. The mineral element Na values obtained in the present study were similar to 0.73-0.80% reported for some selected species of fresh water, while the remaining mineral elements were higher than the values obtained by Fawole *et al*, (2007). Thus the study of mineral elements in living organisms is of biological importance, since many of such elements take part in some metabolic processes and are known to be indispensable to all living things. Conclusively, the use of *Hibiscus sabdariffa* at the different levels did not compromise the nutritional qualities of African catfish.

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Table 1: ***Proximate profile and chemical composition of Clarias gariepinus fed Hibiscus sabdariffa meal diets for 84 days***

Parameters	Initials	HSM1	HSM2	HSM3	HSM4	HSM5	SM6
Moisture (%)	78.62±0.01	76.33±0.26	73.40±0.85	74.42±1.63	74.14±1.98	75.53±1.00	75.84±0.76
Crude protein (%)	62.86±0.01	65.26±1.13	66.60±2.63	67.19±2.71	67.87±2.00	68.07±2.00	67.14±2.44
Crude lipid (%)	8.65±0.01	9.63±0.02	10.16±0.36	9.89±0.24	10.01±0.05	9.99±0.03	9.93±0.11
Crude fiber (%)	1.28±0.00	1.32±0.02^{b}	1.50±0.09^{a}	1.54±0.04^{a}	1.53±0.03^{a}	1.51±0.02^{a}	1.64±0.03^{a}
Ash (%)	16.68±0.06	17.05±0.03	16.96±0.11	17.15±0.18	17.30±0.17	16.79±0.24	16.72±0.24
Nitrogen Free Extract (%)	10.54±0.05	6.75±1.12	4.78±2.49	4.22±2.87	3.29±1.87	3.63±1.96	
Gross Energy (Kcal/kg)	2974.00±0.00	3984.00±0.00^{c}	4104±0.03^{b}	4003±0.04^{c}	3997.00±0.04^{c}	4030.67±0.03^{c}	4032.67±0.05^{a}
Sodium (Na%)	0.38±0.00	0.72±0.03	0.71±0.06	0.76±0.05	0.80±0.04	0.77±0.01	0.79±0.03
Potassium (K%)	1.16±0.00	1.50±0.05	1.34±0.05	1.33±0.01	1.38±0.02	1.35±0.02	1.34±0.01
Calcium (Ca%)	2.96±0.00	3.22±0.10^{ab}	3.33±0.20^{ab}	3.40±0.20^{a}	2.78±0.14^{b}	3.18±0.22^{ab}	3.19±0.19^{ab}
Phosphorous (P%)	2.08±0.00	2.78±0.05^{a}	2.50±0.08^{b}	2.63±0.10^{ab}	2.69±0.09^{ab}	2.62±0.03^{ab}	2.61±0.07^{ab}
Magnesium (Mg%)	0.28±0.00	0.30±0.02	0.32±0.04	0.34±0.03	0.32±0.02	0.35±0.02	0.32±0.03

Values with different superscripts in each row are significantly different (P<0.05)