

## **Histidine: an amino-acid in the Carcass quality and mineral profile of African Catfish *Clarias gariepinus* (Burchell 1822)**

### **ABSTRACT**

150 fingerlings of African catfish (*Clarias gariepinus*) with initial mean weight of  $\pm 5.1$ g was stocked in a glass aquaria and were fed to satiation for 156 days. Histidine was used as a supplement to determine the mineral and carcass quality of African Catfish (*Clarias gariepinus*) fingerlings at varying inclusion levels (0, 0.2%, 0.4%, 0.6% and 0.8%) representing D1 – D5 in a formulated diet of 40% crude protein.

The carcass proximate and mineral composition were significantly improved by histidine supplementation but, exhibited no definite pattern of inclination while, moisture decreased significantly with increased histidine level up to diet D5. The calcium composition were significantly different ( $P < 0.05$ ) with values ranging between 41.0 and 87.6 mg/g DM.

Keywords: African Catfish, Histidine, mineral composition, Carcass quality.

### **INTRODUCTION**

Aquaculture continues to increase, with a gradual movement from traditional, low cost semi-intensive systems to more costly and high yielding intensive systems where, processed feed is a major cost aspect. Sequel to this, production from capture fisheries increased from an average of 86.9 million tonnes live weight between 1985 and 1995 to 96.4m tonnes in 2018, aquaculture production increased from 14.9m tonnes to 81.1m tonnes. Of that, 54.3m tonnes was finfish, with another 32.2m tonnes comprising aquatic algae (UNFAO, 2020).

In Nigeria, fish are a cheap source of animal protein, representing about 50% of the total protein intake (Ayinla, 2007). The input needed to increase growth in the aquaculture sector is feeding which represents about 60% -70% of the total cost of fish production (Nwana 2002).

Emerging evidence from studies with both aquatic and terrestrial animals shows that many essential amino acids regulate key metabolic pathways that are crucial to the maintenance, growth, reproduction and immune responses. In reality, the role of diets supplemented with histidine in the nutrition, growth, minerals and carcass quality of *Clarias gariepinus* is much more complex and is closely interlinked to the dynamics in the pond system.

The target of feed production is to mix proteins of assorted qualities to obtain the needed Essential Amino Acid (EAA) pattern of the fish. Since protein must be supplied to the fish with sufficient amount of essential amino acids, the lower the protein content in the diet, the higher must be the concentration of these amino acids in the protein (Palavesan and Immanuel 2008). Histidine has long been identified as one of the essential amino acids ranking among methionine, lysine, threonine, valine, leucine, tryptophan, etc. while lipids has been established as esters of fatty acids and glycerol and are principal forms of energy storage, (Gupa and Gupta, 2006).

### **2.0 MATERIALS AND METHODS**

## 2.1 Experimental Fish Collection

The fish used in this experiment was purchased from YMR farms Housing Estate, Obalake, Akure, Ondo State. Feed ingredients such as include Fish meal, Soyabean, Groundnut Cake, Yellowmaize, Vitamin premix, Vegetable oil and starch were obtained at Garlfeedmill, Akure.

## 2.2 Experimental Diets

Five diets were prepared by adding (0, 0.2, 0.4, 0.6 and 0.8%) of dietary histidine supplementation in diets formulated to contain 40% crude protein. The diets are tagged as D1-D5. The numerous ingredients were powdered using hammer mill; weighed, mixed to homogeneity and pelleted using a pelleting machine with a 2mm die holes. 300ml of warm water at 70°C was added to the premixed ingredients and mixed until a dough-like paste was formed. The dough was passed through Hobart pelleting machine (Model A200T). The moist pellets were sun dried to a constant moisture level (< 10%) for 5 days, packed in air-tight containers and prior to use and stored in a cool dry place.

## 2.3 Feeding trials

The experiment which was conducted at the Federal Polytechnic Ile-Oluji (FEDPOLEL) Teaching and Research farm. Five dietary treatments (D1-D5) were replicated thrice. A dissolved oxygen level at 7.5-8.35 was maintained throughout the experimental period while the pH ranged between 6.5 and 8.5. The fish was cultured in 15 glass aquaria altogether filled with 5 litres of fresh water and cultured for a period of 56 days.

The experimental fish (*Clarias gariepinus*) was acclimatized for 7 days. 150 fingerlings with initial mean weight of  $\pm 5.1$ g was randomly allotted at the rate of 10 fingerlings per glass tank into five dietary groups tagged as D1 – D5 with each group in triplicate. Fish was fed *ad-libitum* i.e. to apparent satiation twice daily between 7am–8am and 4pm–5pm for 56 days.

**Table 1: Gross Composition of Experimental Diets (40% CP)**

Ingredients	Diet1	Diet2	Diet3	Diet4	Diet5
Fishmeal	30.8	30.8	30.8	30.8	30.8
Soya bean meal	10.3	10.3	10.3	10.3	10.3
Groundnut cake	23.6	23.6	23.6	23.6	23.6
Cottonseed Meal	9.89	9.89	9.89	9.89	9.89
Yellow maize	14.9	14.9	14.9	14.9	14.9
Vitamin Premix	2.50	2.50	2.50	2.50	2.50
Vegetable oil	6.00	6.00	6.00	6.00	6.00
Methionine	0.40	0.40	0.40	0.40	0.40
Lysine	0.20	0.20	0.20	0.20	0.20
Starch	1.41	1.41	1.41	1.41	1.41
Histidine	0.0	0.2	0.4	0.6	0.8

## 3.0 RESULTS AND DISCUSSION

**Table2: Proximate Composition of Experimental Diets**

Parameters	Diet1	Diet2	Diet3	Diet4	Diet5
Moisture	5.67	3.38	3.00	2.67	2.68
Lipid	22.0	22.0	20.0	19.0	20.0
Crude Protein	41.8	41.2	41.2	41.0	41.6
Ash	10.0	9.0	10.0	9.00	9.00
Crude Fibre	4.84	6.64	6.11	5.43	5.99
NFE	15.7	17.8	19.7	22.9	20.8

NFE-Nitrogen Free Extracts

**Table3: proximate composition of *Clarias gariepinus* Fed with Experimental Diets.**

Parameters	Diet1	Diet2	Diet3	Diet4	Diet5
Moisture	2.32±0.34 <sup>b</sup>	4.43±1.91 <sup>ab</sup>	8.09±2.54 <sup>ab</sup>	5.66±4.09 <sup>ab</sup>	10.8±5.33 <sup>a</sup>
Ash	12.0±2.00 <sup>ab</sup>	12.0±2.00 <sup>ab</sup>	11.3±1.15 <sup>b</sup>	16.7±4.16 <sup>a</sup>	12.0±2.00 <sup>a</sup>
Lipid	26.0±1.73 <sup>a</sup>	27.3±1.16 <sup>a</sup>	25.0±6.25 <sup>a</sup>	27.3±3.22 <sup>a</sup>	25.7±1.53 <sup>a</sup>
Crude protein	53.2±1.04 <sup>a</sup>	53.9±3.54 <sup>a</sup>	52.8±4.53 <sup>a</sup>	49.4±2.56 <sup>a</sup>	52.1±6.00 <sup>a</sup>

Means in the same column with different superscripts are significantly different. (P<0.05).

**Table4: Mineral composition of *Clarias gariepinus* fed with Experimental Diets (mg/g DM)**

Parameters	Diet1	Diet2	Diet3	Diet4	Diet5
Ca	87.6±0.49 <sup>a</sup>	41.0±1.01 <sup>e</sup>	70.3±0.30 <sup>c</sup>	79.4±0.28 <sup>b</sup>	67.2±0.16 <sup>d</sup>
Phosphorus	76.6±0.73 <sup>a</sup>	51.5±1.60 <sup>b</sup>	43.7±0.29 <sup>c</sup>	72.9±6.21 <sup>a</sup>	55.4±0.59 <sup>b</sup>
Magnesium	5.09±0.52 <sup>a</sup>	4.12±0.21 <sup>b</sup>	2.62±0.45 <sup>c</sup>	5.08±0.16 <sup>a</sup>	4.02±0.54 <sup>b</sup>
Manganese	0.81±0.03 <sup>a</sup>	0.59±0.10 <sup>c</sup>	0.51±0.02 <sup>c</sup>	0.74±0.04 <sup>ab</sup>	0.71±0.02 <sup>b</sup>
Zinc	1.35±0.38 <sup>a</sup>	0.98±0.45 <sup>a</sup>	0.94±0.04 <sup>a</sup>	1.00±0.31 <sup>a</sup>	1.11±0.16 <sup>a</sup>

Means in the same column with different superscripts are significantly different. (P<0.05).

The results of the carcass analysis of the recent study shows that there were no significant differences (P> 0.05) in the lipid and protein composition. The highest lipid was in fish fed Diet 2 (27.33%). The highest moisture contents were recorded in fish fed Diet 5 (10.76) while the least

value was in fish fed diet 1. Fish fed diet 2 had the highest protein content with the least in fish fed diet 4. There are no significant differences ( $P > 0.05$ ) in the ash content of the fish fed in all the treatments and values.

Nwanna *et al.*, (2016) indicated that calcium and phosphorus contents of the fish made up about 80-90% of the total minerals making them the most dominant inorganic component in the fish, this was found to be true in the recent experiment as calcium and phosphorus constituted a high proportion in the fish carcass. Other minerals such as zinc and manganese were also present but in minute quantity.

Different fish species exhibit wide variations in histidine requirements, (Zehra and Khan, 2014) reports 1.91-2.06% in *Catla catla*. In *Heteropneustes fossilis*, (Khan and Abidi, 2014) reports 3.51 – 3.63g 100g<sup>-1</sup> dietary protein which was found to be higher than *Labeo rohita* 2.25g 100g<sup>-1</sup> dietary protein (Murthy and Varghese, 1995).

## Conclusion

Conclusively, carcass proximate composition and minerals were significantly improved by histidine supplementation. However, the reports of optimum histidine requirements of *Clarias gariepinus* from the present study was found to be about 0.83% of the dietary protein and 0.33g 100g<sup>-1</sup> protein.

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