The Effect of Supplementing Blood Meal with Graded Level of Methionine in Diet of *Clarias gariepinus* (Burchell 1822) Fingerlings.

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Abstract

A study of the growth rate of Clarias gariepinus (fingerlings) fed blood meal as a diet with graded level of methionine was carried out. The fish was reared for 120 days to compare the effect of different inclusion level of methionine to blood meal as a diet. 1.3, 2.0, 2.7, and 3.4 g, methionine inclusion level were used for treatment one to four ($T_1 – T_4$) respectively, the control treatment (T_0) had no methionine inclusion. The fishes were fed twice a day at 5% body weight for the period. Sampling was done biweekly to determine the growth performance of the fish. Results for the experiment showed significant difference ($p<0.05$) in the final mean body weight, mean body length and specific growth rate with the highest in treatment 4. The fish in treatment 4 also consumed more feed ($p < 0.05$) attaining better ($p < 0.05$) feed conversion ratio values than in treatment 1, 2 and 3 respectively. The physiochemical parameters of the experimental water showed 4.0 – 5.7 m/l, 6.5 – 7.0 and 25 °C – 26 °C for dissolve oxygen, pH and temperature respectively. The study showed that 3.4 g inclusion level of methionine to blood meal as a diet for Clarias gariepinus (fingerlings) is ideal and the most effective for the growth performance

Keywords: *Blood meal, Methionine, Fishmeal.*

Introduction

Fish is an important source of protein to millions of people worldwide. The success of fish farming business depends on the availability of good quality fish feed that would bring fish to table size within a short time frame. Feed constitutes about 60-70% of the cost of production.

Imported fish feed are expensive and reduce the profitability and growth of aquaculture enterprises. Farmers need an alternative cheaper protein replacement for fishmeal. Blood meal has been recognized as valuable feed and rich sources of essential amino acid needed for fish growth (Hardy, 2006). Unlike other animal protein source, Blood meal has a poor amino acid balance with lysine being relatively high and very low in methionine and isoleucine. Methionine is a nutritionally essential amino acid, and cannot be produced by the fish and must be provided by the diet. It supplies sulphur and other compound required by the fish for normal metabolism and growth. Methionine also belongs to a group of compound called lip tropics or chemicals that help the liver process fats (Health notes, 2004). Amino acid deficiency occur in formulated feed, it can be overcome by supplementing the diet with the deficient amino acid or by using a feed stuff high in that particular amino acid (Robinson and Menghe, 2007). Webster *et al* (1999); and Tacon (1990) suggested that research to develop substitute to high cost feed ingredients should be focused on meat by product (such as blood meal) and microbial protein. Ogunji *et al.*, (2001) in a study on alternative protein sources as substitute for fishmeal in the diet of young tilapia, observed that a proper combination of blood meal, soya bean, groundnut cake and wheat bran can provide 42-45%

protein needed by *O. niloticus*. Complete replacement of fishmeal and fish oil in aquaculture feeds have severe barriers, of indigestibility especially for carnivorous fish, caused by vegetable proteins which have inappropriate amino acid, although inclusion of meat by-product (bloodmeal) can help overcome this problem (Webster *et al.*, 1999, Li *et al.*, 2007).
Animal blood for fish feeds is obtainable from abattoirs in developing countries. Blood meal contains 80-86% crude protein and is an excellent source of lysine. Although blood meal is high in Amino acid (EAA) it is low in methionine. Ogunji (2001) also observed that a blood meal inclusion rate not exceeding 6% may be recommended for *O. niloticus*. Beyond this level, poor performance of fish was noticed and mortality increased.

Analytical work on the whole body protein of *C. gariepinus* shows that methionine makes up 2.77 g/100g protein of the fish (Fagbenro *et al.*, 2001). Several studies have reported the methionine requirement of fish - yellow tail (Zhou *et al.*, 2006); Cimrigala (Ahmad *et al.*, 2006); *Epinephelus coioides* (Luo *et al.*, 2005); channel catfish (Cai and Burttle, 1996) and Fagbenro *et al.*, (1998b) methionine serves as precursor to carnitine (Tacon, 1990).
Harding *et al*., (1977) observed 2.9 g methionine, 1 kg protein for *Anquilla japonica* and 3.1 g methionine, 1 kg protein for *Cyprinus carpio*.

Materials and Methods

Clarias gariepinus (Fingerlings) was purchased from African Regional Aquaculture Centre (ARAC) Port-Harcourt and transported to Umudike. The fish was acclimatized before use in experiment. 18 plastic containers of 70 litres were filled to 50 litres mark with water. Waste siphoning was done daily to remove debris and uneaten fish feed while total water change was done on weekly. 180 fingerlings were distributed randomly to different treatment as T_0, T_1, T_2, T_3, T_4, and T_5 for blood meal diet with graded level of methionine and commercial feed. Each treatment contained 10 fishes with 3 replicate per treatments. Ingredients for feed formulation were purchased from Choba Market in Port-Harcourt, River State. Experiment diet of 35% crude protein for *C. gariepinus* (fingerlings) was formulated with sun dried cattle blood meal, wheat-flour, palm oil, soy bean meal, premix, bone meal and salts. The treatment contained graded levels of methionine, as follows 0.00 of methionine for treatment zero (T_0) and 1.3, 2.0, 2.7 and 3.4 methionine inclusion levels respectively for T_1, T_2T_3 and T_4. Commercially available feed (Copens) was used as treatment five $T_{5.}$ T_0 and T_5 were used as control. The fish was sampled biweekly. Weight gains was noted and recorded. The water parameters: pH, Dissolved oxygen land temperature was measured weekly. The data collected were subjected to analysis of variance (ANOVA) and the differences amongst the mean were separated using least significant difference (LSD).

Result and Discussion

The result of growth performance of the *Clarias gariepinus* fingerlings is as shown in table 1. The feeds were acceptable to the fish and was utilized for growth. Weight and length of the fishes was significantly different ($P<0.05$) influenced by the treatment at the 2^{nd}, 4^{th}, 8^{th}, 12^{th}, and 16^{th} week of observation. The fish achieved final mean weights of 80.10, 83.63, 87.27, 112.10, 161.03 and 159.10 g after 16 weeks, trial for the control and treatments 1-5 respectively. Treatment 4 had a significantly higher ($P< 0.05$) final mean weight with 3.4 g inclusion level of methionine in the blood meal diet than others with 1.3, 2.0 and 2.7 inclusion level respectively. Treatment 5 with commercial feed was almost equivalent with treatment 4. The same trend occurred for the final total body length of 15.48 cm for treatment 4 as against 12.50, 12.67, 13.13, 14.20 and 15.36 cm, for the control and treatment 1, 2, 3 and 5 respectively. In the final mean weight gain of 64.67, 67.06, 71.3, 95.33, 140.16 and 138.13g and final increase in length of 5.83, 5.74, 6.53, 7.03, 7.61 and 7.56 cm. For the control and treatment 1-5 respectively, Treatment 3, 4, and 5 was significantly higher ($P < 0.05$) than the others. The rest of the treatments were significantly the same. Mortality rate was significantly higher ($P < 0.05$) in control and treatment 2 followed by treatment 1, 3 and 5 respectively.

Table 1: Mean performance of Blood meal with different levels of methionine inclusion.

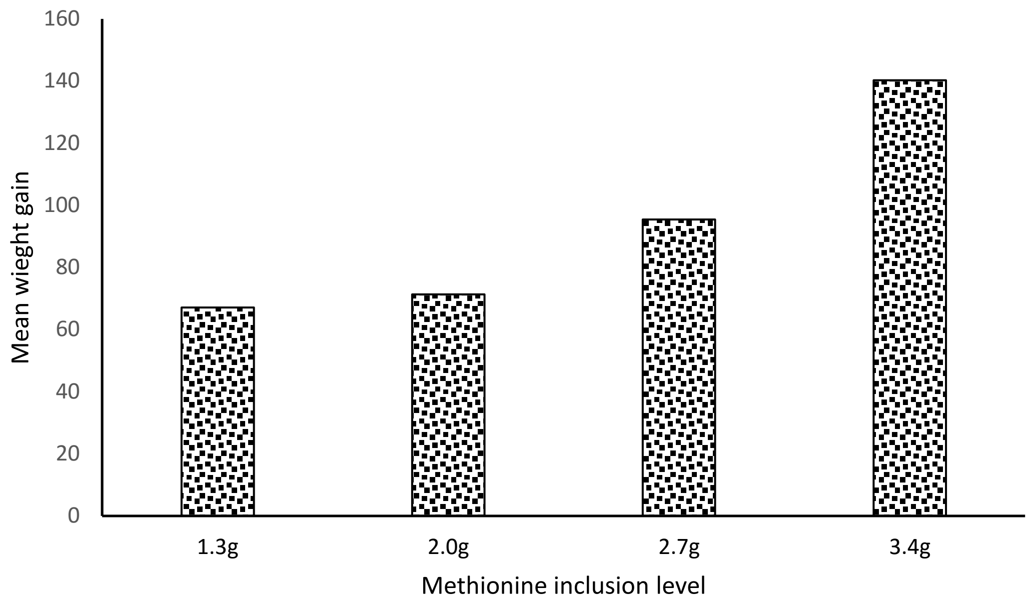
Parameters	**Treatment**					
	T_0	T_1	T_2	T_3	T_4	T_5
Initial weight	15.43	16.57	15.97	16.77	20.87	20.97
Final weight	80.10	83.63	87.27	112.10	161.03	159.10
Initial length (cm)	6.67	6.93	6.60	7.17	7.87	7.80
Final length (cm)	12.50	12.67	13.13	14.20	15.48	15.36
Mean weight gained	64.67	67.06	71.3	95.33	140.16	138.13
Final length gained	5.83	5.74	6.53	7.03	7.61	7.56
Specific Growth Rate	0.77	0.75	0.80	0.90	0.96	0.96
Feed consumption (g)	256.21	268.55	273.51	307.16	442.71	441.89
Feed Conversion Ratio	3.19	3.21	3.13	2.79	2.74	2.80
% Survival Rate	83.3	86.7	83.3	90.0	100	96.7

The result of feed utilization as shown in table 1. Feed consumption was significantly higher ($P< 0.05$) in treatment 4 and 5 (4422.71 and 441.89 g), followed by 3, 2, 1 and control (307.16, 273.51, 268.55 and 256.21g) respectively. In feed conversion ratio (FCR), treatment 4 (2.74) had the best feed conversion ratio than the rest of the treatments. Specific growth rate value was highest in T_4 and T_5 with 0.96 and 0.96% respectively, followed by T_3, T_2, T_0, T_1, with 0.90, 0.80, 0.77 and 0.75 respectively.

The good performance recorded in the treatment 4 in this study may not be unconnected with adequate provision of the essential nutrient required for growth such as crude protein, the critical essential amino acid such as methionine which is characteristically deficient in blood meal, (Morley 1972, Taylor *et al*, 1977). In addition to the inclusion of synthetic methionine, the combination of cattle blood, wheat bran and soybean was effective in the diet. According to Morley 1972, a well-balanced diet is essential for rapid growth high weight gain and other desirable characters. Based on FCR, the observed FCR for treatment 4 (2.74) was close to that observed by Lovell (1988) for the catfish at 2.59.

Based on the finding of Lovell (1989) that growth is the most important criterion for measuring fish response to experimental diet, one may draw a conclusion that treatment 4 with processed fresh cattle blood with 3.4 g inclusion level of methionine was the best in the dietary treatment. Also, this agrees with Fagbenro *et al.*, (1998) that methionine makes up 3.2 g/100g protein of the fish (*Clarias gariepinus*).

Fig 1: Mean weight gain of different inclusion level of methionine in the treatments.



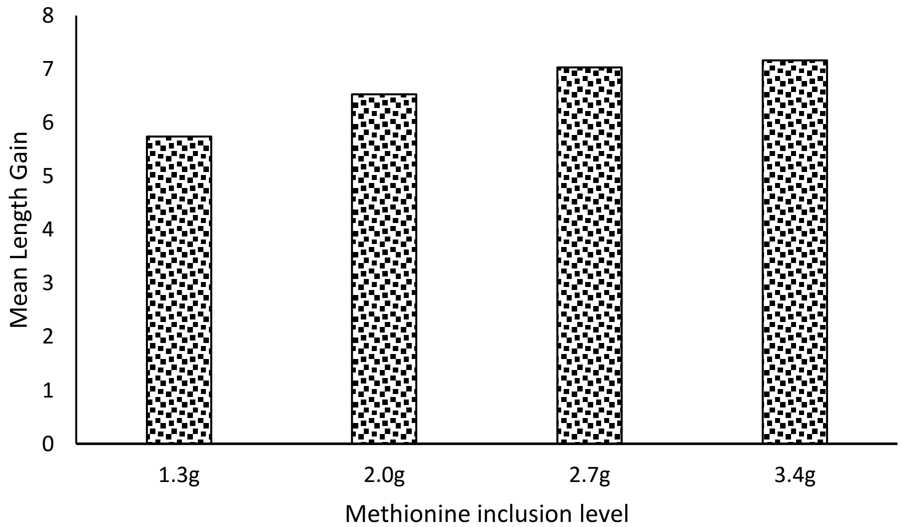


Fig 2: Mean length gain of different inclusion level of methionine in the treatments.

Table 2: Physiochemical parameters of the experimental water.

Weeks / Parameters	1	2	3	4	5	6	7	8
Dissolved oxygen (mg/l)	4.2	4.0	5.4	5.7	4.0	5.7	5.0	4.9
pH	6.5	7.0	6.5	6.8	6.5	7.0	6.9	6.5
Temperature		26	25	25	26	25.5	25	26

Physiochemical parameters (Oxygen Temperature and pH). Table 2above indicates a safe range for the physiochemical parameters which ranged from 4.0 – 5.7 mg/L as the highest value obtained, for dissolved oxygen meter and pH ranged from 6.5 – 7.0 while the temperature ranged between 25 °C – 26 °C using a thermometer.

CONCLUSION

The result of this experiment, showed that supplementation of blood meal with methionine provided an adequate nutrient balance that gave rise to good performance in terms of nutrient utilization, growth and cost effectiveness.

Farmers will benefit economically through the utilization of this cheaper ingredients at 3.4g inclusion level of methionine to the blood meal to raise *Clarias gariepinus* species. However, much more can be achieved by intensifying research on methionine inclusion to blood meal in fish feed for better balance diets in the fish farming industry as desired for fish growth at cheaper fed cost.

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