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Growth Response of *Clarias Gariepinus* Fingerlings To Different Dietary Protein Levels Of Toadmeal Inclusion

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Abstract

A ten-week nutritional study was carried out to evaluate the practical replacement of fishmeal with toad meal in different protein levels in the diet of *Clarias gariepinus* fingerlings. One hundred and fifty (150) fingerlings with an average weight of 7.99 – 27.64g were stocked at the rate of ten (10) fish per experimental tank. The fingerlings were subjected to five different dietary feeds with varying levels of toad meal at 0%, 25%, 50%, 75%, and 100% respectively. Each treatment was replicated. Feeding was done at 3% body weight per day and records of weekly weight increase were kept. The feed conversion ratio, weight gain, survival rate revealed that the control (0% toadmeal inclusion) and diet 5 (100% toadmeal inclusion) were best in growth performance, unlike the mixed fishmeal and toadmeal that showed adequate growth performance Water quality parameters of the experiment measured constantly were within the normal optimum requirements that had no negative effects on the experimental fish.

Finally based on biological and financial evaluation of the feeding trials diet 5 (100%) was recommended as the most economical and practically acceptable for large-scale intensive fish culture.

Key word: Toadmeal, *Clarias gariepinus*, diet, replacements, growth performance

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1. Introduction

Most fish cultural practice in Nigeria is carried out at subsistence level as to what is obtained in developing nation. The obvious deficiency of animal protein has actually created public awareness in the need to further intensify fish production just to ensure that animal protein meets increasing demand.

The prevailing harsh economic condition in present day Nigeria devastate the life of an average Nigerian , thereby rendering his marginal propensity to consume high quality protein food to sustenance level. Comparatively as meat, pork, beef, eggs, and other equally desirable protein rich food items from both plant and animal origin are priced beyond the reach of an average Nigerian, mal-nutrition and starvation are seriously posing threats to human existence in the rural areas. Fishmeal is the major protein source in aquaculture feeds. However, the global supply of fishmeal is not growing and fishmeal must be used more sparingly to improve profitability and sustainability of aquaculture (Falaye et al., 2011) this calls for alternative source of protein that will be cheap, acceptable and adequately meet the nutrient need of fish

In addition, the inability of traditional fisheries to meet domestic needs has regenerated considerable interest in fish farming. The government at federal, state and local levels in Nigeria have gone a long way in arousing the interest of their citizens in fish farming by providing technical assistance, fish seeds subsidizing inputs and training of fisheries personnel's, these calls for a higher demand of high performing fish seeds which are in short supplies and the overall increase in fish production. Studies has shown that many fish scientists have worked on poultry by-product meals diet as replacement for fishmeal in diets for African catfish (Sadiku and Jauncey, 1995; Abdel-Warith et al., 2001), Also, Falaye et al, (2011) studied poultry offal as a possible practical diet replacement of fishmeal for *Clarias gariepinus* fry. The African catfish, Clarias gariepinus, is a commercially important cultured species in Africa. This study was designed to determine the level of toadmeal diet that could be used to replace conventional fishmeal in practical diets for C. *gariepinus* fingerlings stage of growth development

2. Materials and Methods

2.1 Experimental toadmeal diet preparation

Toads (*Bufo regularis*) were caught from the University of Ibadan fish farm, they were killed, properly washed, skinned and oven dried in the university of Ibadan Wildlife and Fisheries management departmental laboratory with a constant temperature of 700C for 3 days. The Toads (*Bufo regularis*) were cut into pieces and ground into fine particles along side with the other feed ingredients, which were bought from Adom (Nig). Enterprises at Orogun, Ibadan, Oyo State, Nigeria. The fishmeal, vitamin premix and salt (NaCl) were already in their powdery forms, while the maize, groundnut cake, bone meal and soya bean meal was made into their powdered state for proper mixing.

2.2 Specific Growth Rate (SGR): SGR (% wd) is:

$$\log_e W_2 - \log_e \frac{W_1 \times 100}{T_2 - T_1}$$

W_2 =weight in Time T_2 days (final)

W_1 =weight in Time T_1 days (initial)

2.3 Percentage Weight Gain (%) Per Week

This was obtained by the relationship

$$\frac{Mean\ Weight\ gain\ per\ week \times 100}{Mean\ weight}$$

2.4. Feed conversion Ratio (FCR)

From the weight gained and feed consumed by each group of fish, the feed conversion ratio (FCR) was calculated using the following expression.

$$FCR = \frac{Feed\ \text{int}\, ake}{Total\ weight\ gain}$$

2.5. Feed Conversion Efficiency (FCE)

$$FCE = \frac{Total\ weight\ gain}{Feed\ \text{int}\, ake}$$

2.6. Protein Efficiency Ratio (PER)

It is the relationship between the increment in weight (the weight gain of fish) and protein consumed.

$$PER = \frac{Mean\ weight\ gain}{\text{Pr}\, otein \quad \text{int}\, ake}$$

2.7. Feed Intake (FI):

This was estimated by the addition of the weekly feed intake during experimental period.

2.8. Analytical Methods

The proximate analysis of experimental diets; also that of the toadmeal and composite sample of fish carcass at the start of the feeding trial and at the end of the experiment were carried out by using methods described by AOAC (1990).

Water Quality analyses of dissolved oxygen, pH and temperature in each of the treatments were determined using the method described by Boyd (1981).

2.8. Statistical Analysis

Results of weight gain, specific growth rate, feed conversion ratio, protein intake, gross efficiency of food conversion, daily protein intake, protein efficiency ratio and percentage survival were pooled for each treatment computed and analyzed using one way analysis of variance (ANOVA) as described by Steel and Torrie (1960).

Significant differences between the means of treatments were tested by multiple range test of Duncan (1955).

3. Results

3.1 Proximate composition of *Bufo regularis* (toad)

The result of the proximate analysis of *Bufo regularis* (Toad) is presented in Table 1 below

Table 1 Proximate Composition of *Bufo regularis*

Parameter	% Dry Weight
Crude Protein	63
Crude Fibre	4.80
Ash Content	10.38
Moisture Content	7.42
Fat (Ether Extract)	5.28
Nitrogen Free Extract (NFE)	4.12

3.2 Proximate Composition of Experimental Diets

The result of the proximate composition of experimental diet is in table 2 below

Table 2 Proximate Composition of Experimental Diets

Diets	Moisture Content	Crude Protein	Ash	Crude fibre	Fat(ether extract
1 (0%)	11.54	36.94	7.00	3.78	7.46
2 (25%)	12.00	36.84	4.15	4.15	4.08
3 (50%)	12.54	35.70	4.35	4.35	3.78
4 (75%)	13.12	36.76	4.56	4.56	4.11
5 (100%)	13.25	36.92	5.23	5.23	4.13

3.3. Proximate analysis of experimental fish

The result of the proximate analysis of the fish (*Clarias gariepinus*) as shown in table 3 indicated that the final proximate analysis of the experimental fish had higher protein content than the initial proximate analysis of the experimental fish

TABLE 3: Initial and Final Proximate Analysis of Experimental Fish

Parameters	**Initial Proximate Analysis**	**Final Proximate Analysis**				
		%	**25%**	**50%**	**75%**	**100%**
Crude Protein	56.60	63.83	61.62	61.01	61.22	64.01
Fat	8.45	6.92	7.25	7.82	7.48	6.63
Ash	7.40	5.05	5.15	5.13	5.24	5.19
Crude Fibre	2.40	1.24	1.19	0.95	1.02	1.42
Moisture content	15.22	9.90	10.53	10.96	11.22	12.08
Nitrogen Free extract	8.43	13.06	13.97	14.13	13.82	10.67

3.4. Growth performance

The result of the growth performance of fish fed with graded levels (0%, 25%, 50%, 75%, 100%) of *Bufo regularis* (Toadmeal) are presented in table.4

Table 4 Growth Performance of *Clarias gariepinus* Fingerling Fed Graded Levels of Toadmeal (*Bufo Regularis*)

Parameters	**Diet 1 (Control)**	**Diet 2 (25%)**	**Diet 3 (50%)**	**Diet 4 (75%)**	**Diet 5 (100%)**
Experimental Period	70	70	70	70	70
No.of Fish Stocked	30	30	30	30	30
Survival Weight (%)	83%	73%	67%	70%	77%
Mortality (%)	17%	27%	33%	30%	23%
Mean Initial weight (g)	8.76	8.17	7.76	8.35	9.38
Mean Final Weight (g)	26.35	19.18	18.74	20.41	23.45
Mean Weight gain (g)	0.52	0.37	0.34	0.39	0.48
Total % weight gain (%)	79.07	57.55	56.24	61.23	70.35
Specific growth rate per day	1.13	0.83	0.90	0.93	0.83
Feed conversion ratio	4.45	7.06	10.29	12.06	5.87
Protein intake	3.03	7.90	7.71	8.26	9.22
Protein efficiency ratio	0.62	0.49	0.49	0.47	0.53
Feed conversion efficiency	0.79	0.62	0.63	0.53	0.68
Gross efficiency conversion	25.40	19.60	20.32	19.14	21.55

3.5. Physio-Chemical Analysis of Experimental Set up

The physical environment of the experimental set up was measured as reported in table 5

Table 5 Physio-Chemical Analysis of Experimental Set up

Parameters	Treatments				
	1	2	3	4	5
Temperature	26.50	26.7	27.0	27.1	27.2
Dissolved Oxygen	3.80	2.70	2.80	3.10	2.20
pH (Hydrogen ion Conc.)	7.1	7.2	6.9	7.0	7.1

4. Discussion

The proximate analysis of experimental diets revealed that they contained an average of 36.63% crude protein. The variation in value may be as a result of toadmeal in the diets. The range is however suitable for growth of *Clarias gareipinus*. An optimum level of protein inclusion recommended in fish diet is between 25-40% (Lovell, 1979). Fingerling requires a higher level of protein than larger fish and recommended a level of 35-40% crude protein requirement for *Clarias* fingerlings (Fatuori et al., 1988). The result of proximate analysis of diets also revealed that the fat content ranged from 3.78% in the diet 3 to 4.13% in diet 5. This might probably have resulted from the level of protein formulation adopted. This range appeared to be suitable for Clarias growth and Falaye (1988b) recommended 6-10% fat contents for Tilapia fingerlings.

The growth rate of fish was highest in diets 1, followed by diets 4, 3, while 2 and 5 with the same growth rate. The comparison of proximate composition of the final and the initial experimental fish at the end of the experiment, there was an increase in crude protein and NFE with a decrease in crude ash content, moisture content, fat and crude fibre after the experiment. An increase in crude protein of all the diets caused a decrease in moisture content due to the toadmeal inclusion in the diets.

The growth performance parameters have shown that the best result were control (diet 1) and diet 5 (100% toadmeal inclusion) then followed diet 4, 2, and 3 with 75%, 25% and 50% toadmeal inclusion respectively. Which is contrary to the result of Falaye et al., (2011) That stated that the inclusion of poultry offal up to 30% was best against 100% poultry offal inclusion, there was a significant difference ($P<0.05$) between diet 1, diet 5 and diet 4, 2 and 3, however, the specific growth rate was highest in diet 1 and diet 4 which shows that the higher the toadmeal inclusion the better. The protein efficiency ratio ranges from 0.47 in diet 4 to 0.62 in diet 1 and there was a significant difference ($P<0.05$) between diet 2 and 5, 2 and 3 and 4. The mean weight gain observed in the fish fed varying levels of toadmeal indicated that all the formulated feed were nutritionally adequate and acceptable to the experimental fish.

The protein efficiency ratio (PER) recorded for fish ranged between 0.47 in diet 4 and 0.62 in diet 1. The result shows significant difference ($P<0.05$) between diet 2 and 5, 2 and 3 and 3 and 4; it was attributed to the quality of protein content in the diet and pattern of ration formulation. Based on Jauncey and Ross (1982) who stated that digestibility of the dietary proteins varied with protein source.

The water quality parameters monitored in the course of this study as in Table 5, were adequate for fish growth in each treatment. The temperature, dissolved oxygen, pH agreed with the reports of Boyd and Licthkoppler (1979), and Swingle (1969). The fish responded positively to feeding during the experimental period. Mortality was only observed after the 7th week and mostly in 25%, 50% and 75% toadmeal inclusions.

5. Conclusion and Recommendation

The influence of utilizing dietary level of toadmeal inclusion to replace fishmeal in the diets of *Clarias gariepinus* was established in this study. The study revealed that toadmeal could be incorporated in the diet of fish at 100% level substituted for fishmeal.

In addition, it was observed that toadmeal substituted for fishmeal at 100% in the diet of *Clarias gariepinus* compared favourably with diets control. With the success of this diet study, It could further be researched into long term feeding trial at a pilot scheme project for further assessment of the nutrient quality of toadmeal.

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