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Effect on Growth of Practical Diet Formulation with Non conventional Animal Protein Sources on Freshwater Catfish (*Clarias magur*)

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ABSTRACT

The present study designed to evaluate the growth performance and survival of *Clarias magur* fed with non conventional animal protein sources. Four iso-nitrogenous experimental diets containing 35 per cent of protein level were prepared using ingredients such as Fish meal, Vermi meal, Chicken viscera, rice polish, wheat flour, vitamin and mineral mixture. Fishes fed with fishmeal based diet showed significantly higher final weight 204.93 g and the best specific growth rate 1.78. There was no significant difference for survival rate during the culture period with replacement of the fish meal component of practical diet with vermi meal and chicken viscera meal for magur. The study concluded that non-conventional animal protein like vermi meal and chicken viscera meal is an acceptable ingredient for the replacement of fish meal protein in practical diets of fishes

Keywords: Chicken viscera, Fish meal, Protein, Specific growth rate, Vermi meal

INTRODUCTION

The catfish (*Clarias magur*) is a highly valued fish in the Indian subcontinent. Most common English name used for this species is walking catfish as it has the capability of crawling long distances through moist, swampy and grassy areas. The magur has very high degree of consumer preference because of inviting taste and therapeutic qualities of its flesh. The magur is one of the popular fish species in fresh water aquaculture due to its omnivorous feeding habits, air-breathing characteristics, rapid growth and good market potential in North Eastern Region of India. However, the production of large quantities of magur seed and desired feed still remains a major bottleneck in popularization of its extensive and intensive culture. Dutta *et al.* (2019) reported that the fish farmers of North Eastern Region of India were not getting good quality seeds and feed which are major problems in adoption of scientific fish farming. Protein is the main but expensive ingredient in the aqua feed formulation, the quality and quantity of which in fish feeds formulation plays a vital role in promoting fish growth Pandian *et al.* (2001). Fish meal is unsustainable both environmentally and financially as a protein source for fish feeds (Tacon and Nates, 2007). To achieve a good growth, catfish requires complete artificial feed of 35 per cent to 45 per cent protein level (Nyina Wamwiza *et al*., 2010). Kaushik (1998) observed the catfish requires relatively high levels of dietary animal protein for rapid growth and hence fishmeal has traditionally been used as a major protein source. Very few information is available regarding the use of non-conventional animal protein sources in practical diet formulation for fresh water catfish. Giri *et al.* (2010) showed that dried chicken viscera can be incorporated up to 30 per cent in the diet for juveniles of *Clarias batrachus* without affecting

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nutrients digestibility and can be used as a replacer of expensive fishmeal in the diet. The price of fishmeal has increased greatly within the past decade due to the high demand which inhibits small scale aquaculture enterprises in rural areas from increasing their fish production by using higher quality feed inputs. Hardy (2010) felt the need to search for alternative for highly nutritious feed ingredients in aqua feeds. Considering the need of cheap diet for *Clarias magur* that can be easily adoptable by the farmers of the northeastern region of India, present study was designed to evaluate some non conventional animal protein sources for nursing and rearing of the fresh water catfish.

METHODOLOGY

The research work was conducted in the Department of Aquaculture, College of Fisheries Sciences, Assam Agricultural University, Raha, Nagaon, Assam. The specimens of magur were divided into four groups and each group was reared in triplicate separate tanks for 180 days, maintaining a stocking density @ 4 nos/m^2. The experimental tanks were provided with six inch of soil bed and water level was maintained at 50 ± 5 cm. Water from experimental tanks were analyzed for temperature, pH, DO, CO_2, alkalinity etc. on the day of stocking and thereafter at 30 days interval, following the standard methods of APHA (2005). Liming of the tanks was done to maintain water pH between 6.5 to 8.0.

Four iso-nitrogenous experimental diets containing 35 per cent of protein level were prepared using ingredients such as Fish Meal, Vermi meal, Chicken viscera, rice polish, wheat flour, vitamin and mineral mixture.

Table 1: Composition (%) of feed ingredients in experimental diets

Feed Ingredients	D-1	D-2	D-3	D-4
Vermi meal	60	-	28.5	-
Chicken viscera meal	-	53	28.5	-
Fish meal	-	-	-	50
Rice polish	22	31	26	25
Wheat flour	17	15	16	24
Agrimin Forte*	1	1	1	1

*Feed Supplement of Vitamins and Minerals marketed by Virbac Animal Health India Pvt. Ltd.

Proximate analysis of the selected ingredients was carried out by standard methods of AOAC (2005). The Diet 1 (D1) was formulated by 100 per cent replacement of Fish Meal with Vermi Meal; Diet 2 (D2) was formulated by 100 per cent replacement of Fish Meal with Chicken Viscera Meal; Diet 3 (D3) was formulated by 100 per cent replacement of Fish Meal with mixture of Vermi Meal and Chicken Viscera meal and Diet 4 (D4) was Fish Meal based reference diet (Table 1). Each group having both the sexes of *Clarias magur* were fed @ 10-5 per cent body weight in two split doses daily once in the morning and next in the evening. The sampling was done at the day of stocking and every fortnight for growth study.

RESULTS AND DISCUSSION

The water temperature in the cemented tank system ranged between 22.1°C to 32.5°C (Table 2). Dissolved oxygen remained between 5.59 mg/l to 5.67 mg/l (Table 3). The water quality parameters like, DO, depth, pH,

Table 2: Water temperature of the tanks during culture period

Month	Temperature (°C) Treatment 1		Temperature (°C) Treatment 2		Temperature (°C) Treatment 3		Temperature (°C) Treatment 4	
	Range	Avg.	Range	Avg.	Range	Avg.	Range	Avg.
July	24.3 – 31.8	28.8	24.0 – 32.0	28.1	24.2 – 31.6	28.1	24.4 – 31.9	28.9
August	24.4 – 32.2	29.1	25.0 – 32.5	29.2	24.5 – 32.1	29.0	25.1 – 32.4	29.1
September	23.7 – 31.0	28.7	24.0 – 32.0	28.5	23.6 – 31.2	29.2	23.5 – 31.1	29.1
October	23.8 – 30.1	27.2	22.0 – 30.0	26.7	23.5 – 30.4	27.1	23.7 – 30.3	27.6
November	22.7 – 28.0	26.1	21.0 – 28.5	25.3	22.5 – 28.5	25.9	21.1 – 28.3	25.1
December	22.2 – 25.5	23.9	22.1 – 25.4	23.3	22.3 – 26.0	24.2	22.4 – 25.9	23.7

CO_2, total alkalinity, total hardness and ammonia did not recorded any marked trend in the treatments during the culture period (Table 3). All the water quality parameters varied insignificantly in treatments. It might be due to management practices done at regular interval of time i.e. liming and water exchange.

In order to formulate 04 different practical diets for catfish magur, some important biochemical parameters of feed ingredients used in the experiment were analysed (Table 4). The iso-nitrogenous feeds were designed to contain 35 per cent crude protein (Table 5). Similar type of studies was reported by Giri *et al.* (2010) where dried chicken viscera was used as a complete and superior substitute of marine by-catch fishmeal without adversely affecting the performances of *C. batrachus* fingerlings, when incorporated in a 500 g kg^{-1} diet. Oke *et al.* (2016) recommended that up to 30 per cent of chicken viscera meal could be incorporated in the diets of *C. gariepinus* without negative effects on growth and whole body composition. In this study of replacement of the fish meal component of practical diet with vermi meal and chicken viscera meal for magur, it was inferred that there was no significant difference for survival rate during the culture period (Table 7). Although the initial average weight of the fishes was same in all the treatment, fishes fed with fish meal based diet showed significantly highest final weight 204.93g (Table 6) and the best specific growth rate 1.78 (Table 7) compared to those 100 per cent replacement of Fish Meal with Vermi Meal, 100 per cent replacement of Fish Meal with Chicken Viscera Meal and 100 per cent replacement of Fish Meal with mixture of Vermi Meal and Chicken Viscera meal diet. These results are similar to those obtained by Cayen *et al.* (2016) in their study on replacement of fish meal with

Table 5: Some important biochemical parameters of experimental diets

Parameters	D-1	D-2	D-3	D-4
Protein (%)	35	35	35	35
Lipid (%)	6.8	11.4	9.2	7.9
Fibre (%)	6.2	7	6.5	5.4
Ash (%)	13.7	7.4	10.4	10.1
NFE (%)	38.3	39	38.8	41.5
Dry matter (%)	90.0	90.3	90.2	90.2
Moisture (%)	10.0	9.7	9.8	9.8

Values are mean ± SD, n = 3

Table 3: Water quality parameters observed during the culture period

Tanks	Sampling Details for Water Quality Parameters						
	Water depth (Meters)	D O (mg/l)	Water pH	CO_2 (mg/l)	Total Alkalinity (mg/l)	Total Hardness (ppm)	Ammonia (ppm)
Treatment 1	0.52 ± 0.03	5.65 ± 0.17	7.83± 0.22	1.77 ± 0.30	233.69 ± 13.26	153.08 ± 16.75	0.02 ± 0.01
Treatment 2	0.52 ± 0.03	5.67 ± 0.17	7.82 ± 0.16	1.68 ± 0.25	236.97 ± 17.29	152.78 ± 15.79	0.02 ± 0.01
Treatment 3	0.52 ± 0.02	5.63 ± 0.21	7.78± 0.23	1.72 ± 0.23	240.75 ± 14.90	152.19 ± 18.31	0.03 ± 0.01
Treatment 4	0.52 ± 0.03	5.59 ± 0.19	7.84± 0.22	1.64 ± 0.20	238.94 ± 13.93	153.17 ± 17.05	0.02± 0.01

Values are mean ± SD, n = 12

Table 4: Some important biochemical parameters of feed ingredients used in the experimental diet preparation

Ingredients	Protein (%)	Lipid (%)	Fiber (%)	Ash (%)	NFE (%)	Dry matter (%)	Moisture (%)
Fish meal	59.0 ± 0.2	9.0 ± 0.2	1.0 ± 0.10	15.1 ± 0.1	15.8 ± 0.2	90.0 ± 0.6	10.0 ± 0.6
Vermi meal	51.0 ± 0.2	6.5 ± 0.1	3.2 ± 0.1	19.1 ± 0.1	20.2 ± 0.4	88.2 ± 0.1	11.8 ± 1.0
Chicken viscera Meal	58.0 ± 1.0	14.2 ± 0.9	1.9 ± 0.1	8.1 ± 0.2	17.7 ± 1.4	90 .3± 0.8	9.7 ± 0.8
Rice polish	9.1± 0.2	12.0 ± 0.1	19.0± 0.2	10.2 ± 1.0	49.7 ± 1.2	89.7 ± 0.6	10.3 ± 0.6
Wheat flour	12 ± 0.5	1.7 ± 0.1	0.9 ±0.01	0.6 ±0.2	84.8 ± 0.7	89.2 ± 1.0	10.8 ± 1.0

Values are mean ± SD, n = 3

Table 6: Length- weight of *C. magur* reared using different experimental diet

Experimental group	Days of culture			
	1st day		180th day	
	Average length (cm)	Average weight (g)	Average length (cm)	Average weight (g)
Group fed with Diet-1	6.92 ± 0.8	8.69 ± 1.3	23.30 ± 2.0	181.30 ± 22.8
Group fed with Diet-2	6.87 ± 1.16	8.67 ± 1.48	23.24 ± 1.37	200.81 ± 22.42
Group fed with Diet-3	6.90 ± 1.18	8.29 ± 1.60	23.33 ± 1.35	190.32 ± 30.05
Group fed with Diet-4	6.81 ± 0.66	8.30 ± 0.80	23.52 ± 1.29	204.93 ± 21.98

Values are mean ± SD, n = 90

Table 7: Percentage weight gain, SGR, FCR and PER

Days of culture	Group fed with Diet-1	Group fed with Diet-2	Group fed with Diet-3	Group fed with Diet-4
Percent Survival	100	100	100	100
Percent Weight Gain	1986.3	2216.1	2195.8	2369.0
SGR	1.69	1.75	1.74	1.78
FCR	1.71	1.54	1.62	1.50
PER	1.67	1.86	1.76	1.90

broiler chicken viscera on growth of catfish *Clarias gariepinus*. The food conversion ratio (FCR) was found better in diet 4 followed by diet 2, diet 3 and diet 1 (Table 7). Samad *et al.* (2014) also reported a FCR 2.02 where the *Clarias batrachus* was fed with formulated diet of 30 per cent protein containing poultry viscera, mustard oil cake and rice polish.

CONCLUSION

The results of the earlier researcher's studies as well as outcome from the present study indicated that non-conventional animal protein like vermi meal and chicken viscera meal is an acceptable ingredient for the replacement of fish meal protein in practical diets of fishes but still a lot of improvement is required in strategy and technology of culturing of *Clarias magur* to make it more successful and adoptable at farmers' level. The work on evaluation of some non-conventional animal protein sources in practical diet formulation for fresh water cat fish magur and its effect on growth will definitely benefit the farming community.

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