Culture of *Clarias Magur* Using Non Conventional Animal Protein Feed: A Case from North Eastern Region of India

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ABSTRACT

A multi locational trials on culture of Clarias magur *using some Non Conventional Animal Protein feedwas carried out to evaluate the Specific growth rate (SGR), Feed conversion ratio (FCR), Protein efficiency ratio (PER) and consumer preference of the cultured fish during two successive years 2019-2020 in North Eastern region of India. The study revealed that* Clarias magur *can be cultured with nonconventional animal protein like vermi meal and chicken viscera meal. The results of the study reflected that 100% replacement of fish meal can be done with chicken viscera without affecting the growth performance of the fishes. The feed conversion ratio ranged 1.5 to 1.75 for the fishes grown by feeding with meal based diets and 1.54 and 1.77 for chicken viscera meal diets.*

Key words*:* Clarias magur; *Specific growth rate; Feed conversion ratio; Protein efficiency ratio;*

The fresh water aquaculture activities is growing very fast in the states of North Eastern Region and Composite fish culture with major carps is the most popular and dominant fish culture practice in North Eastern Region and Assam in particular (*Bhuyan et al, 2013*). Now the aqua farming industry is entering to an arena by crossing the traditional boundary of concentration on farming of major carps to the culture of other species like catfishes. Among catfishes the catfish *Clarias magur,* locally known as magur is a high valued fish in the NE Region of India. 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. *Hussain, et al, (2018)* opined that it is essential to develop suitable location specific good aquaculture management practices which are economically viable, environment friendly and socially acceptable for NE region of India. During the last decade several researches has been conducted on culture of magur. The catfish requires comparatively high levels of dietary animal protein for rapid growth (*Mishra and Mukhopadhyay,1996*) and fishmeal has traditionally been used as a major protein source as it contains balanced essential amino acids profile, fatty acids, vitamins and minerals (*Kaushik, 1998*). 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. This, in turn, leads to the search for alternative highly nutritious feed ingredients in aqua feeds (*Hardy, 2010*). The research on other alternative for nonconventional protein sources to replace fishmeal in fish feed becomes of great importance for the catfish farming industry in India especially for *Clarias magur.* Use of earthworms and chicken viscera in fish feed has been reported by many researchers as an alternative source of protein. *Chakrabarty et al,* (*2009*) reported that earthworms contain many essential amino acids along with hemoglobin in their blood serum, which provide the required iron also. *Sobana and Jegadeesan, (2016)* has demonstrated culture of *Catla catla* feeding with earthworm based feed and observed better nutritional impact as compared to the fishes with conventional diet.

The chicken viscera are available in NE Region throughout the year at a very low price but not been commonly utilized as an animal protein source in aqua feed. *Giri et al, (2010)* observed that dried chicken viscera can be incorporated up to 30 per cent in the diet of *Clarias batrachus* without affecting nutrients digestibility. A very few information are available regarding the use of non conventional animal protein sources in practical diet formulation for fresh water cat fish *Clarias magur*. Considering the need of feed technology which is easily adoptable by the farmers of the NE region of India for growing magur, present multi locational trails has been conducted using some non conventional animal protein feed.

METHODOLOGY

The trials were conducted at Raha, Nagaon, Assam which is geographically located at $26^0$12'56.20644"N latitude, $95^0$30'11.49912" E longitude and an altitude of 62.0 m above mean sea level (MSL) and in Pasighat, Arunachal Pradesh geographically located at $28^0$4'26.35752"N latitude, $95^0$19'28. 2" E longitude and an altitude of 151.0 m above mean sea level (MSL).

The experimental fishes were reared maintaining a stocking density @ 4 no.s /m^2 in outdoor cement cisterns(6m × 4m × 1.5m); tanks were provided with six inch of soil bed and water level was maintained 50 ± 5 cm. Liming of the tanks were done to maintain water pH between 6.5 to 8.0. Water from experimental tanks were analyzed for temperature, p^H, DO, CO_2, alkalinity etc. on the day of stocking and thereafter at 30 days interval, by following the standard methods of *APHA, 2005*.

Four 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. Proximate analysis of the diets and ingredients was carried out by standard methods (*AOAC, 2005*). 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 and for calculation of different parameters like percentage weight gain, Specific growth rate (SGR), Feed conversion ratio (FCR) and Protein efficiency ratio (PER). The organoleptic evaluation of *Clarias magur* was done by Hedonic scale method. For this the fishes were processed for steaming and then steamed fished were evaluated by respondents of age group 18-60 years.During the process of steaming, fishes were kept in the steamer's rack after making equal size pieces and proper cleaning, wrapping in aluminum foil and marking for each group. The bottom of a steamer was filled with 1.0 inch of water making sure the rack is elevated above the water and then it was covered properly and brought the water to boil. Steaming was done till the fishes cooked properly. For *Clarias magur* 15 minutes steaming is sufficient. No salt as well as ingredients were used.

RESULTS AND DISCUSSION

The iso-nitrogenous feeds were designed to contain 35 per cent crude protein using the selected ingredients as per the requirement illustrated in Table 1. In the treatment-1 ingredients used were Vermi meal, Rice polish, Wheat flour and Agrimin Forte in a ratio of 60 per cent, 22 per cent, 17 per cent and 1 per cent respectively. In treatment-2 ingredients Chicken viscera meal, Rice polish, Wheat flour and Agrimin Forte were mixed in a ratio of 53 per cent, 31 per cent, 15 per cent and 1 per cent respectively. The treatment-3 was prepared with a composition of ingredients *viz*. Vermi meal, Chicken viscera meal, Rice polish, Wheat flour and Agrimin Forte in a ratio of 28.5 per cent, 28.5 per cent, 26 per cent, 16 per cent, and 1 per cent respectively. The control treatment-4 was a fish meal based diet where ingredients Fish meal, Rice polish, Wheat flour and Agrimin Forte were used in a ratio of 50 per cent, 25 per cent, 24 per cent and 1 per cent, respectively.

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

Feed Ingredients	T-1	T-2	T-3	T-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

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

Although there was no significant difference (P > 0.05) in initial average weight of the fishes for all the

treatments, it was noted that fishes fed with fishmeal based diet have showed significantly highest final weight in both the experimental locations (Table 2). The average initial weight of the fishes in location Raha, Nagaon, Assam for group fed with treatment-1, 2, 3 and 4 were 8.69 g, 8.67 g, 8.29 g and 8.30 g respectively, which are not significantly different. Data recorded on Mean values of length and weight of *C. magur* at Raha, Nagaon, Assam on 180th day of culture showed maximum average length (23.52 ±1.29) and average body weight (204.93 ± 21.98) in treatment-4 whereas the lowest average length (23.24 ± 1.37) was in treatment-2 and average body weight (181.30 ± 22.8) was in treatment-1. The result reflects that growth performance in terms of weight gain of the group fishes fed with treatment-4 was the best followed by treatment-2, treatment-3 and treatment-1.

Similarly, at Pasighat, East Siang, Arunachal Pradesh, maximum average length (24.21 ±1.5) was recorded in treatment -1 and highest average body weight (194.54±30.81) was recorded in treatment -4 whereas the lowest average length (23.58±1.11) was in treatment-4 and lowest average body weight (174.58 ±23.2) was in treatment-1. The results reflected that for both the locations of study, growth performance of the group of fishes fed with treatment-4 was best followed by treatment-2, treatment-3 and treatment-1 (Fig. 1). Statistical analysis of the growth data revealed that the performance of treatment-2 and treatment-4 was at per. Similarly, *Oke et al, (2016)* recommended that up to 30% of chicken viscera meal could be incorporated in the diets of *C. gariepinus* without

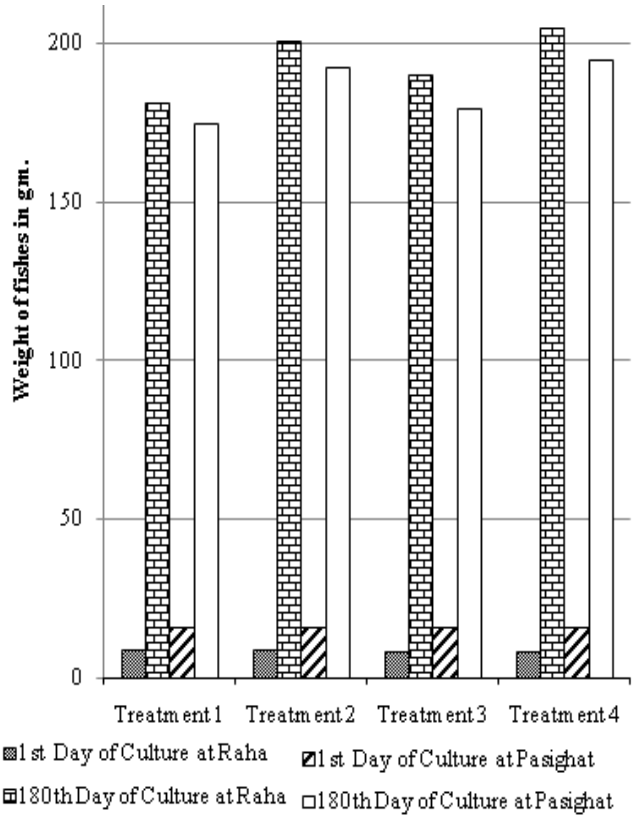

Fig. 1. Weight gain of fishes for both the location of study with different treatments

Table 2. Mean values of Length and weight of *C. magur* at different locationsreared using different experimental diets

Days of culture	Treatment-1		Treatment-2		Treatment-3		Treatment-4	
	AveL (cm)	AvW (gm)	AveL (cm)	AvW (gm)	AvL (cm)	AveW (gm)	AvL (cm)	AvW (gm)
Raha, Nagaon, Assam								
1st day	6.92 ± 0.8	8.69 ± 1.3	6.87 ± 1.16	8.67 ± 1.48	6.90 ± 1.18	8.29 ± 1.60	6.81 ± 0.66	8.30 ± 0.80
180 days	23.30 ± 2.0	181.30 ± 22.8	23.24 ± 1.37	200.81 ± 22.42	23.33 ± 1.35	190.32 ± 30.05	23.52 ±1.29	204.93 ± 21.98
Pasighat, East Siang								
1st day	10.33 ±1.2	15.64 ±4.1	10.11±1.08	15.69±4.11	10.27 ±0.77	15.91 ±3.88	9.60±1.98	16.09±7.80
180 days	24.21] ±1.5	174.58 ±23.2	23.85±1.44	192.61±25.34	24.02 ±1.06	179.69 ±26.00	23.58±1.11	194.54±30.81

Values are mean ± SD, n = 90; AvL = Average Length (cm) AvW= Average Weight (gm)

Table 3. Percentage weight gain, SGR, FCR and PER

Parameters	Treatment-1		Treatment-2		Treatment-3		Treatment-4	
	Raha	Pasighat	Raha	Pasighat	Raha	Pasighat	Raha	Pasighat
% Weight Gain	1986.3	1016.2	2216.1	1127.6	2195.8	1029.4	2369.0	1109.1
SGR	1.69	1.34	1.75	1.39	1.74	1.35	1.78	1.38
FCR	1.71	1.97	1.54	1.77	1.62	1.91	1.50	1.75
PER	1.67	1.45	1.86	1.62	1.76	1.50	1.90	1.63

Table 4. Distribution of respondents based on level of preference (N =05)

Level of consumer preference (Score)	Treatment 1		Treatment 2		Treatment 3		Treatment 4	
	No.	%	No.	%	No.	%	No.	%
Highly preferred (5)	-	-	-	-	-	-	-	-
Moderately preferred (4)	-	-	-	-	-	-	-	-
Equally Preferable (3)	05	100	05	100	05	100	05	100
Less preferred (2)	-	-	-	-	-	-	-	-
Not preferred (1)	-	-	-	-	-	-	-	-

negative effects on growth and whole body composition.

The observation for % weight gain, specific growth rate (SGR), food conversion ratio (FCR) and protein energy ratio (PER) is mentioned in Table 3. Data recorded on percentage weight gain, SGR, FCR and PER revealed that maximum % weight gain at Raha, Nagaon, Assam was (2369.0) in treatment-4 whereas minimum (1986.3) was in treatment-1. SGR was recorded maximum (1.78) in treatment-4 while minimum (1.69) was in treatment-1. FCR was recorded maximum (1.71) in treatment-1 whereas minimum (1.50) was in treatment-4. PER was recorded maximum (1.90) in treatment-4 while minimum (1.67) was in treatment-1. Similarly at Pasighat, Arunachal Pradesh maximum % weight gain was (1127.6) in treatment-2 whereas minimum (1016.2) was in treatment-1. SGR was recorded maximum (1.39) in treatment-2 while minimum (1.34) was in treatment-1. FCR was recorded maximum (1.97) in treatment-1 whereas minimum (1.75) was in treatment-4. PER was recorded maximum (1.63) in treatment-4 while minimum (1.45) was in treatment-1. Earlier researcher (*Cayen, et al, 2016*) also attained similar results in their studies on replacement of fish meal with broiler chicken viscera on growth of catfish *Clarias gariepinus*.

The feed conversion ratio was found better in treatment- 4 (1.5 at Raha and 1.75 at Pasighat) followed by treatment-2, 3 and 1at both the locations. Similar types of observations were reported by *Samad et al,* (2014) in their studies where they fed *Clarias batrachus* with formulated diet of 30 per cent protein containing feed ingredients like Poultry viscera, Mustard oilcake and Rice polish and they recorded FCR value of 2.02.

In the present study though the fishes reared under different treatments showed significant variation in growth. But while assessing the consumer preference by Hedonic scale method it was found that all the groups were equally preferred (Table-4). This study showed that dietary protein source has effect on growth and digestibility in magur but there was no variation in consumer preference. Similar observation has been reported in channel catfish by *Webster et al,* (1993), where they found no significant difference in organoleptic quality of cage-reared channel catfish fed with four different diets. Statistically non-significant differences were also observed in sensory attributes of flesh of *Labeo rohita* by *Iqbal et al,* (2015), while feeding with different feed ingredients. In recent study by *Monge-Ortiz et al*, (2020) for Mediterranean yellow tail (*Seriola dumerili*) fed diets with partial replacement of fish meal by other protein sources reported that feeding with high fish meal substitution diets affects *Seriola dumerili* growth; despite this the quality of the fillet was not affected. However, from the best of our knowledge this is the first study that analyses the organoleptic alterations in *Clarias magur* fed with alternative proteins.

CONCLUSION

The study revealed that *Clarias magur* can be cultured with nonconventional animal protein like vermi meal and chicken viscera meal. Resource poor farmers with a limited area and input can easily culture magur; this easy method of culturing magur will provide them an opportunity to sustain their livelihood as well attain nutritional security. Farmers can easily culture vermi as well as collect chicken viscera. The technology of using locally available nonconventional inputs as a feed ingredient will definitely benefit the farming community of North Eastern region.

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