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EFFECT OF LOW COST FEED ON THE GROWTH PERFORMANCE OF PRAWN (*MACROBRACHIUM ROSENBERGII*) IN *GHER* FARMING SYSTEM

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Abstract: Fresh water giant prawns (*Macrobrachium rosenbergii*) were reared in 12 mini *ghers* at a density of 2 individuals /m² for 90 days. The average initial weight of the species was 7.88 ± 0.023g. There were four treatments each of which with three replications. The control was done by feeding the prawns with a commercial prawn feed. Two farm made low cost feed, incorporating soybean and mustard oil cake, were prepared and fed the prawns to compare the growth performance with the commercial prawn feed and designated as T-1 and T-2 respectively. In another treatment, prawns were kept in natural condition and designated as T-3. The water quality of the *ghers* was monitored and found to be within acceptable limits. There was a significant difference (P<0.05) among the treatments. Although some nutrition was derived from the natural productivity of the *gher*, it was not sufficient for the optimum growth of the reared species indicating lowest growth in T-3. Good growth performance was observed in control and T-1 and no significant differences (P>0.05) were found between them. Relatively lower growth rate was observed in T-2. Though control indicated the best growth performance, soybean containing supplemental feed could be used to obtain satisfactory production in relation to economics of production.

Keywords: *Macrobrachium rosenbergii*; Galda; Prawn feed; *Gher* culture; Growth; Water quality

Introduction

Prawns (*Macrobrachium rosenbergii*) play an important role in economy of Bangladesh. Bangladesh earned 1188.91 crore taka by exporting 25742 metric ton shrimps and prawns during the fiscal year 1996-'97 (DOF, 1997). Prawn culture is related with the socio-economic condition of the fish farmer. Most of the fish farmers in Khulna, Satkhira and Bagerhat districts reared prawns in *gher* farming system where prawn culture was incorporated with paddy. In such system, prawns received their feed from nature in low stocking density. But with the increase in density, natural feed was no more available to fulfil the requirements of prawns. As a result, reduced growth was observed. Some of the prawns were also found to disappear due to its cannibalistic character. To overcome such problems and to achieve higher growth performance, supplemental feeds were applied. Such feed indicated many food items viz. snail meat, cooked rice, rice bran, commercial fish and shrimp feed, etc. Therefore, the present study was undertaken with the following objectives:

- i) to find out a suitable low cost feed for prawn culture in *gher* farming system
- ii) to compare the efficiency of low cost feed with commercial fish feed
- iii) to find out the potentiality of utilizing locally available feed ingredients for the development of appropriate prawn feed.

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Materials and Methods

Twelve earthen mini *ghers* were excavated. Each of the *ghers* had a 50 m² surface area and 1 m depth of peripheral canals. All *ghers* were rain fed. The experiment was conducted for 90 days to observe the growth performance of prawns (*Macrobrachium rosenbergii*). Prawns were provided with different types of commercial and low cost farm made supplementary feed. There were four treatments each of which with three replicates. Two farm made feed using different levels of ingredients (Table 1 and Table 2) was prepared to feed the prawns. These were treated as T-1 and T-2. In another treatment, prawns were reared in natural condition without supplying any feed or fertilizer and was designated as T-3. A commercial prawn feed (Saudi-Bangla Prawn Feed) fed to the prawn was treated as control.

Table 1. Different feed ingredients and their protein levels.

Ingredients	Protein (%)
Fish meal	50.81
Mustard oil cake	30.33
Rice polishing (Oriza sativa)	12.10
Soybean meal (Glycine max Mechanically extracted)	42.90
Wheat flour (Triticum aestivum)	11.70
Wheat flour by-product	16.40

Source: National Research Council (NRC), USA, 1983; Fisheries Research Institute, Research Project Report No. 1, 1989

Table 2. Formulation and cost of different farm made feed.

Ingredients	Feed for T-1		Feed for T-2	
	Inclusion rate (kg)	Cost (Tk.)	Inclusion rate (kg)	Cost (Tk.)
Fish meal	15.00	450.00	15.00	450.00
Soybean meal	20.00	240.00	--	--
Mustard oil cake	--	--	36.00	288.00
Rice polishing	27.50	123.75	19.50	87.75
Wheat flour	10.00	122.50	10.00	122.50
Wheat flour by-product	27.50	192.50	19.50	136.50
Total	100.00	1128.75	100.00	1084.75

The Saudi-Bangla Prawn Feed indicated a minimum level of 25% protein (Table 3) in accordance with suggestion of New (1987).

Table 3. Proximate composition of different commercial and farm made feed.

Parameters Feed	Pellet Dia. (mm)	Cost/kg (Tk.)	Moisture (%)	Crude protein (%)	Lipid (%)	Ash (%)	Crude fibre (%)	NFE*
Saudi-Bangla Prawn feed	2.5	19.40	11.93	26.77	7.24	12.20	7.40	34.64
Diet for T-1	2.0	11.29	9.24	27.88	7.05	8.72	6.22	40.89
Diet for T-2	2.0	10.85	10.44	28.25	8.37	8.31	6.39	38.12

*Nitrogen free extract (soluble carbohydrate) calculated as: NFE = 100 - % (Moisture+Crude protein+Lipid+Ash+Crude fibre)

Liming was done at a rate of 1kg/decimal. Before stocking all the prawns were well acclimatized to the *ghers*. About two and half months old juvenile prawns were released to the *ghers*. The average weight of the prawns with an average weight of 7.88 g ±0.023 g was then released at a stocking density of 2/ m². The feeds were supplied to the prawn twice at a level of 5% body weight per day. To adjust the feeding level and to observe the growth performance of the prawns, sampling was carried out fortnightly. Throughout the experimental period, the water quality parameters such as temperature, pH and dissolved oxygen (in the early morning) were monitored daily while total alkalinity was measured fortnightly.

Results and Discussion

Water Quality: Water quality parameters were monitored as a routine work (Table 4). Water temperature in all the varied between 25 to 30^o C throughout the experimental period. The temperature was suitable for juvenile prawn (Willis and Berrigan, 1977). The pH range of water in the *ghers* varied between 7.5 to 7.9 and was optimum for prawn culture in accordance with the findings of Swingle (1967). The total alkalinity was observed to vary between 110 to 175(mg/l). The highest was recorded in control (175 mg/l) and lowest (110 mg/l) in T-2 treatment respectively. Alikunhi (1957) stated that the highly productive water bodies should have more than 100 mg/l alkalinity. The present study indicated good water quality. Dissolved oxygen levels of the *ghers* ranged from 2.5 to 5.0 mg/l (in the early morning). The lowest concentration observed in T-2 and T-3 (2.5 mg/l) while highest in T-1 (5 mg/l). Juvenile fresh water giant prawns tolerate dissolve oxygen concentration of 1.0 to 1.5 mg/l (early morning) though it is not advisable to allow extended period at such levels (Wulff, 1982). Among all the treatments, the dissolved oxygen levels were higher than 1.5 mg/l. In accordance to the findings of Wulff (1982), it could be said that the dissolved oxygen levels were within satisfactory limits.

Table 4. Water quality parameters of the experiment.

Treatments parameters	Control	T-1	T-2	T-3
Temperature(°C)	25-30	26-30	25.5-29	25-30
pH	7.5-7.9	7.6-7.9	7.5-7.8	7.5-7.9
Dissolved Oxygen (mg/l)	3.5-4.5	3-5	2.5-4.5	2.5-4.0
Total alkalinity (mg/l)	122-175	118-172	110-162	116-165

Stocking and Recovery of Prawn: The prawns were well adapted to the gher, because there is an evidence that a significant difference existed between the pH of the water in which the post larvae have been stored and transported and that of the gher. This could cause serve mortality due to thermal shock (Sarver, *et al.*, 1982). The average recovery rate was (85.92 ± 2.03)% (Table 5). The highest was observed in control (93%) and lowest in T-2 (80%). These indicated high survival rate as Willis and Berrigan (1977) suggested survival rates of 50% as acceptable in farming practice.

Table 5. Stocking, yield and growth parameters of the prawns.

Items	Control	T-1	T-2	T-3
Stocking	100	100	100	100
Recovery rate (%)	93.00	89.33	80.00	81.33
Mean initial wt. (g/individual)	7.87	7.87	7.90	7.90
Mean final weight (g/individual)	41.80	37.34	35.09	20.34
Crude Food Conversion Ratio	2.127	2.284	2.772	--
Specific Growth Rate (%)	1.85	1.73	1.66	1.05
Yield (g/m ² /90 days)	62.13	50.99	40.30	17.14
Yield (kg/ha/yr.)	2485.20	2039.60	1601.20	685.60

Growth Performance: Until 30 days of rearing, no significant difference in growth among the treatments was observed (Table 6). However, with increased rearing time, significant differences (P<0.05) in growth were found among the treatments. Control and T-1 treatment indicated better growth performance. The lowest growth performance was observed in T-3 treatment. Although no statistical significant difference (p>0.05) in growth between control and T-1 was observed, T-1 showed comparatively slower growth performance. Farm made feed prepared for T-1 contained defatted soybean meal (Table 2). Raw soybean contains crystalline globular protein that acts as trypsin inhibitor (Mickelsen and Yang, 1966). Trypsin inhibitor can be inactivated through heat

processing (Ham and Sandstedt, 1944); however, excessive heat can reduce the availability of certain amino acids, particularly lysine. At the time of oil extraction from soybean, heat produced causing destruction of lysine or destruction of a fraction of trypsin inhibitors. This may be responsible for comparatively slower growth performance in T-1. After 90 days of rearing, T-2 showed a significantly ($P < 0.05$) lower growth performance compared to control. T-2 contained mustard oil cake (Table 2). Probably having little amount of thiaminase (Goldsmith, 1964). Thiaminase is responsible for slower growth in T-2. Moreover, all the farm made feeds containing rice polishing and this may possess some growth inhibitors responsible for impaired growth performance (Goldsmith, 1964).

FCR was found to be lowest in (2.127) and highest in T-2 (2.772) (Table 5). T-1 showed slightly higher FCR (2.284) than the control. Highest SGR was observed in control (1.85%) and lowest in T-3 (1.05%). This indicated that in all cases control showed the best performance. T-1 also showed better growth performance as no significant difference was found between control and T-1. The poorest growth performance was observed in T-3.

Figure 1. Growth performance of the prawns at different treatments

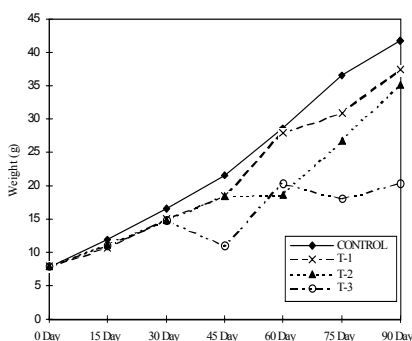


Figure 1. shows the growth (body weight) of prawns in control, T-1 and T-2 which increased with the increased in rearing time. However, T-3 remained almost constant until 60 days of rearing. This could be due to increase demand of food requirement with increase standing crop. Therefore, if the prawns do not get adequate food, the body weight may remain constant. Hephher (1978) stated that when standing crop of fish reaches a level at which natural food is sufficient only for maintenance and no feed is left, growth ceases entirely. To overcome such

problem, additional feeds were supplied to control, T-1 and T-2. As no feed was supplied to T-3, the growth of the prawns remained constant.

Table 6. Growth performance of prawns.

Days	Treatments	Control	T-1	T-2	T-3
0 Day		7.78 ^a	7.87 ^a	7.90 ^a	7.90 ^a
15 Day		11.94 ^a	10.73 ^a	11.29 ^a	11.05 ^a
30 Day		16.54 ^a	15.00 ^a	14.78 ^a	14.75 ^a
45 Day		21.61 ^a	18.44 ^a	18.41 ^a	11.00 ^b
60 Day		28.67 ^a	27.90 ^a	18.57 ^b	20.42 ^{ab}
75 Day		36.49 ^a	30.89 ^a	26.67 ^{ab}	18.10 ^b
90 Day		41.80 ^a	37.34 ^{ab}	35.09 ^b	20.34 ^c

*Super script of the same letter in row indicates no significant differences between the treatments.

Conclusion

The present study showed that inspite of good water quality and acceptable stocking density, growth performance of prawns under natural production was poorer and thus they need additional feed. Good growth performance could be obtained by feeding prawns with either commercial fish

feed (Saudi-Bangla Prawn Special Feed) or soybean containing farm made feed at a feeding level of 5% body weight /day. Though commercial fish feed yielded better (62.13 g/m²) growth performance compared to T-1 (50.99 g/m²), soybean containing supplemental feed could be used to obtain good growth performance if economic point is considered.

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