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Evaluation of egg custard for freshwater prawn, *Macrobrachium rosenbergii* (de Man) larvae culture

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Abstract

A study was conducted for a period of 45 days to evaluate the efficiency of egg custard in substituting *Atemia* nauplii for post larvae production of giant fresh water prawn, *Macrobrachium rosenbergii*. Three Treatments were designed for feeding with three replications as follows: (i) Treatment T_1, alternate diet (1st 10 days only *Artemia* then only egg custard), (ii) Treatment T_2, combined feed (*Artemia* and egg custard) and (iii) Treatment T_3, egg custard. Stocking density of larvae was 50/liter. Larvae cultured on combined diets had the highest ($P<0.05$) mean production rate 26.07±1.13 /l with a corresponding survival of 52.13±2.14%. The post larval yield for the group of larvae fed egg custard alone was nil. This result indicate that rearing of *M. rosenbergii* larvae using only custard is not possible. During the feeding of combination diet it was observed that larvae were not fed artificial feed before 7 days of rearing period. artificial feed. The survival rate of larvae fed alternate diet (7.27±0.08%) was significantly lower ($P<0.05$) than the survival rate of larvae fed combined diet (52.13±2.14%). It indicate that egg custard alone (after 10 days) might not be adequate diet as *Artemia* for higher production of *M. rosenbergii* post larvae. It is concluded from the present study that combined diet (*Artemia* and custard) can be used for larvae rearing of *M. rosenbergii* and custard can be used after 10 days of rearing period with *Artemia*.

Keywords: Prawn, Custard, *Artemia*, Post-larvae

Introduction

The culture peculiarity of prawn, *Macrobrachium rosenbergii* is that though they are grow, mature, fertilize, even hatch and about 90% of global prawn production is done in freshwater environment, their larvae neither can survive nor grow up to post-larval stage without brackish water. Therefore, prawn culture in the country, is being developed in and around the coastal areas, depending on naturally collected seeds. Though only few prawn hatcheries are being operated, their production rate is not consistent and far below the country's requirement. This means the pressure on natural resources will be growing, resulting in shortages in natural seed supply. In addition, intensification of prawn culture is existing farms and further expansion in new farms would increase the demand for post-larvae. Some private entrepreneurs are producing large numbers of post-larvae of *M. rogenbergii* for culture in ponds throughout the country. These hatcheries are facing problems due to high price of *Artemia* cysts. The high cost of *Artemia* cysts and their occasional scarcity is a major concern in the expansion of *M. rosenbergii* hatcheries, particularly in the Asian region (Aniello and Singh, 1982). Thus the current study was undertaken to evaluation of egg custard in the production of *M. rosenbergii* post-larvae.

Materials and Methods

An experiment was carried out in the prawn hatchery of Bangladesh Fisheries Research Institute (BFRI), Mymensingh, for a period of 45 days from mid July to August 2003 to evaluate the suitability of egg custard for larval culture of freshwater prawn, *Macrobrachium rogenbergii*. Nine fiber glass tank were selected for this experiments. The water holding capacity of each tank was 300 liter. Three Treatments were designed for feeding with three replications as follows: (i) Treatment T_1, alternate diet (1st 10 days only *Artemia* then only egg custard), (ii) Treatment T_2, combined feed (*Artemia* and egg custard). and (iii) Treatment T_3, egg custard.

Brine (150 ppt) was collected from salt pans of Cox's Bazar. The brine was mixed with freshwater to prepare 12 ppt saline water. The prepared salt water solution was bleached with 60% chlorinated bleaching powder at a dose of 12 ppm and aeration was performed. After one day, this salt water was treated with 12 ppm sodium thio-sulphate and air was blown for one day. Then it was kept undisturbed for one day for settling down of the precipitates. The supernatant clear water was then collected for rearing of larvae.

Brown coloured egg bearing prawns were collected from the experimental pond and were released in the hatching tank with 6 ppt saline water treated in 20 ppm formaline solution for minimizing any contamination. Air was blown in the hatching tank from the air blower. After hatching of eggs, larvae of zoae-i stage were transferred to the larvae rearing fibre glass tank containing 12 ppt saline water. Stocking density was 50/l. Aeration was maintained in the larvae rearing tank by air blower.

Saline water of 30 ppt was used for *Artemia* hatching. After completion of the hatching, the aeration was stopped. The nauplii were then gathered at the bottom of the hatching jar. They were then collected by siphoning in a beaker for feeding the prawn larvae. In treatment 3 larvae were fed only egg custard. The ingredients of egg custard were 60% egg and 40% powder milk. The ingredients were mixed by a blender and boiled for 30 min to make a cake. Then the egg custard was pass through small mess net and the small particles were washed in water to remove the soluble materials. The smaller particle sized custard was fed to smaller larvae and as the larvae grew up the custard particle size was also increased. All uneaten feed were removed after one hour of feeding from larvae rearing tank. After three days interval 30% water was changed. The larvae were reared up to post larval stage (PL), when they took the shape of adult prawn and started swimming changing from backward to forward movement and changing from upside down to normal position. At the end of the experiment, all prawns were collected and counted to find out the survival rate. Proximate analysis of *Artemia* and egg custard was done following the standard procedure. The results of the proximate analysis of the food items used in this experiments are given in Table 1.

The physico-chemical parameters of the rearing tank were measured by using different method. Temperature was recorded by a Celsius thermometer everyday. The pH and DO were measured twice a week using Oxygen Meter and pH Meter. Ammonia was measured by portable water test kit. Salinity of each larval rearing tank was checked every alternative day with a Refractometer. Any increase in salinity through evaporation was corrected by adding tap water.

Table 1. Pximate analysis of *Artemia* and egg custard

Food Value	Percentage	
	Artemia	Egg custard
Moisture	8.96	37.13
Protein	58.75	34.59
Lipid	16.89	13.78
Ash	7.23	6.02
Carbohydrate	8.17	8.48

Statistical analysis

One way analysis of variance (ANOVA) was performed to determine the treatment effects. Significant differences between treatments were determined by using Duncan's multiple range test (DMRT) at 5% level of significance.

Results and Discussion

Values of water quality parameters during the experimental period are shown in Table 2. In treatment 1, the average value of dissolved oxygen was 7.23±0.12 mg/l, temperature, 28.49±0.51 °c, pH, 8.06±0.81, NH_3, 0.23±0.04 mg/l and salinity 12.02±0.98 ppt. In treatment 2, the average value of dissolved oxygen was 7.51±0.23 mg/l, temperature, 28.98±0.75°c, pH, 7.99±0.75, NH_3, 0.34±0.02 mg/l and salinity 11.95±0.67 ppt. In treatment 3, the average value of dissolved oxygen was 6.51±0.87 mg/l, temperature, 28.62±0.38 °c, pH, 8.12±0.37, NH_3, 0.31±0.03 mg/l and salinity 12.13±0.57 ppt. The values of water quality parameters of three treatments were not significantly different (P>0.05). The mentioned values of the water quality parameters observed during experimental period were well within the acceptable range given by New and Singholka (1985)

Table 2. Average values of water quality parameters of deferent treatments

Parameters	T_1	T_2	T_3
Temperature	28.49±0.51 [a]	28.98±0.75 [a]	28.62±0.38 [a]
DO (mg/l)	7.23±0.12 [a]	7.67±0.37 [a]	7.51±0.23 [a]
pH	8.06±0.81 [a]	7.99±0.75 [a]	8.12±0.37 [a]
Ammonia (mg/l)	0.23±0.04 [a]	0.34±0.02 [a]	0.31±0.03 [a]
Salinity (ppt)	12.02±0.98 [a]	11.95±0.67 [a]	12.13±0.57 [a]

[a] Values in the same column with same superscripts did not differ significantly (P> 0.05)

Prawn post-larval production for various treatments is presented in Table 3. Larvae cultured on combined diets had the highest (P<0.05) mean production rate 26.07±1.13 /l with a corresponding survival of 52.13±2.14%. The post larval yield for the group of larvae fed egg custard alone was nil. In this treatment (T_3) all larvae were dried after 5-6 days of rearing

period. This result indicate that rearing of *M. rosenbergii* larvae using only custard is not possible. The survival rate of larvae fed alternate diet (7.27±0.08%) was significantly lower ($P<0.05$) than the survival rate of larvae fed combined diet (52.13±2.14%). The larvae fed alternate died had the higher mortality after 10 days of rearing period when only egg custard was fed. This indicates that custard can not able to fulfill the nutritional requirements of larvae and egg custard alone might not be adequate as *Artemia* for higher production of *M. rosenbergii* post larvae.

Table 3. Production of *M. rosenbergii* post-larvae reared on egg custard and *Artemia* for a period of 45 days

Treatments	Stocking density		Survival		
	Total larvae	Per litter	Total post-larvae	Per liter	Survival (%)
T_1	15000	50	1090.5±129[a*]	3.64±0.64 [a]	7.27±0.08 [a]
T_2	15000	50	7819±339[b]	26.07±1.13 [b]	52.13±2.14 [b]
T_3	15000	50	Nil	Nil	Nil

*Means in each column not sharing a common superscript letter are significantly different ($P<0.05$)

Hasan *et al.* (2002) conducted an experiment on rearing of *M. rogenbergii* using different diets. They found that the survival rate of larvae fed on only *Artemia* was 10%, larvae fed on custard was nil and larvae fed on combined diet (*Artemia* and egg custard) was 45%. Sureskumar *et al.* (1998) observed the survival rate of *M. rogenbergii* larvae to be 35%. Chiranjib *et al.* (1999) stocked larvae at the density of 60/L and found survival rate to be 54.4%. Alam *et al.* (1993) observed 44.02% survival rate of *M. rogenbergii* using *Artemia* as larval feed. Similar results were obtained in case of 60 zoea-1 /L of *M. rogenbergii* in backyard hatchery (Pramanik and Haldar, 1996). It is evident that survival rate varies due to the different management system of larval rearing. It also varies with quality of brine and presence of iron in water. Ohs *et. al.*(1998) found that survival and growth of larvae fed live *Artemia* nauplii was significantly greater than those of larvae fed spray-dried diets. They also stated lowest survival and growth rates were observed when larvae were fed artificial diets exclusively from the onset of exogenous feeding and survival rates were positively related to the duration of feeding live *Artemia* nauplii before weaning to artificial diets. Kumlu and Jones (1995) found that survival *M. rosenbergii* larvae fed on microencapsulated diet (Frippak CD3) from Z5-6 to PLI was 28%. They also found that survival of larvae fed on artificial feed were lower than those fed on the live feed. The inability of the early larvae of *M. rosenbergii* to survive on artificial diets is attributed to their undeveloped guts and limited enzymatic capabilities. Trypsin activity in the larvae was determined for all larval stages. It was found that the highest trypsin activity of larvae after 10 days coincides with a rapid increase in the volume of the hepatopancreas and the formation of the filter apparatus. These morphological changes in the structure appear to enable the larvae to utilize artificial diets after10 days. The production results suggest that combined diet (*Artemia* and custard) can be used for larvae rearing of *M. rosenbergii* and custard can be used after 10 days of rearing period with *Artemia*.

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