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The Efficacy of Molluscan Flesh in the Production of Prawn in Bangladesh

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Abstract: Experiments were conducted to evaluate the dietary effects of molluscan flesh (*Pila globosa, Bellamya bengalensis* and *Lamellidens marginalis*) fresh, boiled and endogenous products, pellets (40% rice bran, 30% wheat bran, 20% mustard oil cake and 10% prawn head powder) on growth, survival and production rate of *Penaeus monodon* under traditional upgraded extensive method. The maximum survival rate, individual increment in length and weight, production rate and profit were 80.4%, 1.71 mm and 0.57 gm day^{-1}, 989.88 kg ha^{-1} and 115.58%, respectively from the culture supplemented with fresh molluscan flesh and pellet food in equal proportions. Fresh molluscan flesh with pellets in equal proportions was the most effective feed followed by fresh molluscan flesh.

Key words: Molluscan flesh, prawn production, Bangladesh

Introduction

Farming of any animal is not feasible without a constant supply of appropriate food since it often fluctuates or may not be adequate. *Penaeus monodon* Fab. the commercially most important species of prawn in Brackish water of Bangladesh requires supplemented animal feed for maximum production through intensive farming. According to Mac Nae (1974) about 60,28,780 ha of potential tidal flat area is available on the Southwestern coastline of Bangladesh for prawn culture. Hossain (1988) stated that prawns are abundant in the vast area of 2300 m^2 occupied by the greatest mangrove forest of the world, Sundarbans due to the availability of sufficient food materials and requisite environmental factors. Among the various available species of prawn, *P. monodon* is being extensively cultured in brackish water of Bangladesh.

However, almost all of the required environmental factors for high production of prawn are prevailing in brackish water area of Bangladesh yet the production rate is low. Lack of technological knowledge and modern facilities for intensive prawn culture are the major causes for such low production rate in the country. Maximum production rate might be achieved by nursing the culture with potential foods.

Karim and Khatun (1974), Karim and Aldrich (1976), Bhuyan *et al.* (1977), Ekramullah (1989), Mazid *et al.* (1990) and Ranu *et al.* (1993) worked on the food habit, effect of natural and supplementary foods on growth, production and survival rate of prawn in Bangladesh. Flesh of *Pila globosa* and *Bellamya bengalensis* is an important food item for African magur, *Clarias griepinus* (cat fish) and freshwater prawn, *Macrobrachium rosenbergii* (Jahan and Rahman, 2000). The snail, *P. globosa*, is one of the major feed used by the farmers from June to November when they grow golda, *M. rosenbergii* (Ahmed *et al.*, 2000).

Sufficient snails and mussels are available throughout the year in fresh water bodies of Bangladesh. The flesh of these animals could be engaged as supplementary feed for high production rate of prawn. Accordingly, experiments were conducted to evaluate the efficacy of molluscan flesh on growth, survival and production of *P. monodon* Fab. commercially.

Materials and Methods

The experiments were carried out for a period of four months from 15th March to 15th July, 1994 in ten ponds covering 0.04 ha each of Shagor Prawn Farm, Harinagar, Satkhira under the traditional upgraded extensive method of this region. Juveniles of *Penaeus monodon* were collected from the rivers of Sundarbans. After acclimatization for 24 h, the prawns were stocked at a density of 25000 ha^{-1}.

Prawns were fed with hand prepared four types of supplemented food along with the planktons flourished in natural condition. *Pila globosa*, *Bellamya bengalensis* and *Lamillides marginalis* were considered as the source of molluscan flesh. Food Type-A comprising of boiled molluscan flesh and supplied in the pond A_1 and A_2. Food type-B comprising of fresh molluscan flesh and supplied in the pond B_1 and B_2. Food type-C comprising of 50% fresh molluscan flesh and 50% pellet (40% rice bran, 30% wheat bran, 20% mustard oil cake and 10% prawns head powder) and supplied in the pond C_1 and C_2. Food Type-D comprising only above pellet and supplied in the pond D_1 and D_2. No supplementary food was allowed for Food type-E (control type) but the planktons flourished in the natural conditions were available to the prawns in the

pond E_1 and E_2. Feeds were always administered in submerged trays so that remnant, if any could easily be taken out before decomposition and to know the acceptability of the diet by the prawns. After every 20 days, regular sampling was done to monitor the growth of prawns. After 4 months of monoculture, drying the ponds did final harvesting.

Pond wise survival rate, growth rate, growth increment per individual per day and growth increment percent were calculated following the formulae given by Hossain *et al.* (1992). Food conversion ratios (FCR) were calculated following by New (1987) and percent profit was determined by calculating cost returns following the procedure mentioned in Chowdury (1984). Appropriate statistical methods were applied to analyze the obtained data.

Results and Discussion

The growth performances of *P. monodon* Fab. nourished with different food types and the percent survivals, production rates, food conversion ratios (FCR) and profit percentages were observed (Table 1, 2). The growth patterns in length and weight of *P. monodon* Fab. fed with different diets were depicted (Fig. 1a, 1b). Maximum growth increment percentage in length and weight over the initial figures were obtained as 858.5 and 113780, respectively when prawns fed with supplemented Food Type C (Table 1). Minimum growth increment percentage in length and weight over the initial figures were obtained as 700 and 64900, respectively for prawns cultured in ponds without any supplemented Food-Type E (Table 1). Highest survival (%) (80.4±0.88) and production (989±4.68 kg ha^{-1}) were obtained in case of prawn nourished with supplemented Food Type-C (Table 2). On the other hand, lowest survival (63.2%) and production (490±14.31 kg ha^{-1}) were obtained from the culture without any supplemented food (Food Type-E) (Table 2). It has been found that different diets influenced growth, survival and production rate significantly ($P<0.001$).

Note:

Food Type A = Boiled molluscan flesh
Food Type B = Fresh molluscan flesh
Food Type C = 50% fresh molluscan flesh+ 50% pellet (40% rice bran, 30% wheat bran, 20% mustard oil cake and 10% prawn head powder)
Food Type D = Pellet
Food Type E = No supplementary food (control)

Fig. 1a and 1b show the pattern of average increment in length and weight attained by the individual prawns nourished with the concerned various food types during the period of 100 days, respectively. From the figures, it is evident that the rate of increment in length was very rapid during the period of first 40 days of culture than that in the following 40 days and then with a diminishing trend whereas the rate of increment in weight was negligible for the first 20 days. After which it got rapidity and such trend continued up to the 100 th day of culture. The increment rate both in length and weight was maximum in case of prawns cultured on supplemented Food type–C (fresh molluscan flesh and pellet in equal proportion) followed by those nourished with fresh molluscan flesh (Food type -B). Karim and Khatun (1974) obtained best survival rate, maximum average length and weight in case of the shrimp fed with animal diet. Ranu *et al.* (1993) tested the effect of formulated feed (58% frog waste +22.8% wheat flour + 15% bone meal + 2% soybean oil +2% shark liver oil + 0.2% vitamin-C) for the growth of *M.*

Table 1: Growth performances of *P. monodon* Fab. nourished with different foods

	Length (mm)					Weight (g)				
Food types	Initial	Final	Total increment	Individual increment (mm day^{-1})	Increment (%)	Initial	Final	Total increment	Individual increment (g day^{-1})	Increment %
A	20.0	175.4	155.4	1.55	777	0.05	43.22	43.17	0.43	86340
B	20.0	187.5	167.5	1.68	837	0.05	52.98	52.93	0.52	105860
C	20.0	191.7	171.7	1.71	858	0.05	56.94	56.89	0.57	113780
D	20.0	170.1	150.1	1.50	750	0.05	39.87	39.82	0.42	79640
E	20.0	160.1	140.1	1.40	700	0.05	32.50	32.45	0.32	64900

Table 2: Mean±SD of survival, production, food conversion ratio and profit percentage of *P. monodon* Fab. over four months of treatments with five different diet

Food types	Survival (%) (mean ±SD)	Production (Kg hr^{-1}) (mean ± SD)	Food conversion ratio (FCR) (mean ±SD)	Profit percentages
A	73.2±0.95	673±5.21	3.94±0.05	64.69
B	75.1±0.95	863±8.83	3.87±0.01	95.08
C	80.4±0.88	989±4.68	3.56±0.03	115.58
D	69.9±1.03	673±14.76	4.09±0.05	55.09
E	63.2±0.99	490±14.31	Cont.	54.48

LSD Value DMRT at 5%, level 7.73, C>B≥A≥D>E 5.69, C>B>A≥D>E

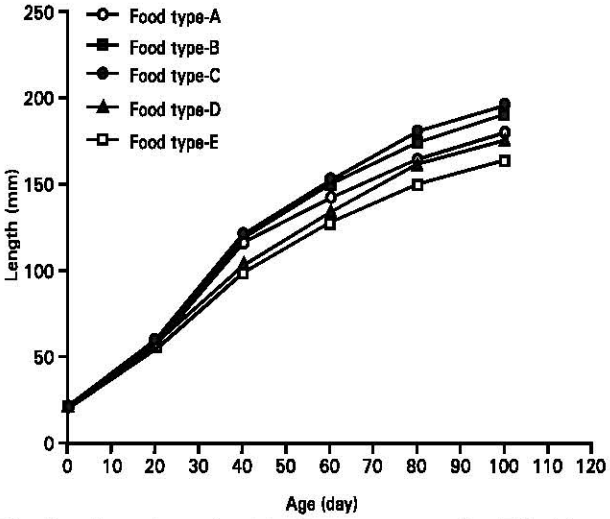

Fig. 1a: Length attained by *Penaeus monodon* Fabricius fed with vaious diets

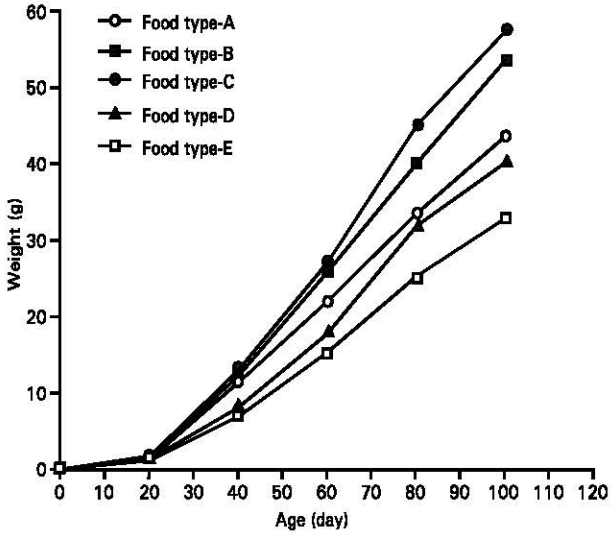

Fig. 1b: Weight gained by *Penaeus monodon* Fabricius fed with various diets

rosenbergii. They found that frog flesh waste was nutritious and acceptable feed with low conversion ratio to *M. rosenbergii*. The present experiments revealed that maximum individual increment in length and weight were obtained as 1.71 mm day^{-1} and 0.57 gm day^{-1} for *Penaeus monodon* fed with supplemented food type-C. The maximum (80.4%) survival rate was determined in the culture fed with the same food type. The maximum 989.88 kg ha^{-1} prawn harvested when food type-C was supplemented which resulted in maximum (115.5%) percent of profit. On the contrary, minimum 490.50 kg ha^{-1} harvested from the controlled culture which resulted in minimum 54.48% profit. The minimum FCR (3.5±0.03) was obtained in case of food type-C, which was followed by food type-B (3.87±0.01) prove the suitability, palatability and the conversion efficiency of the Food Types. Which might supports the proposition of Goodwin and Hanson (1975) and New (1976) that the efficiency and suitability of a shrimp diet depend upon different factors like composition, water stability, palatability and above all conversion efficiency.

Fresh or frozen feed such as trash fish, clam meat, squids, shrimp, snail and mussel etc. are used as food by prawn (Tseng, 1988). In 1977, formulated food became the main diet, supplemented by trash fish to balance the prawn nutritional needs in Taiwan (Liao, 1984). By 1982, trash fish was replaced largely by locally available small Mytilidae mussels (*Mytilus sp.*) and by a sergestidae shrimp (*Acetes erythraeus* Nobli) (Chaing and Liao, 1985). Accordingly, the production of *P. monodon* in the country has risen to over 30,000 metric tons in 1985 (Tseng, 1988). Chen and Ramos (1989) are of the opinion that the prawn culture industry owes much to the development of artificial feeds. They estimated that at least 40,000 tons of wet food like trash fish, shrimp, sea snails *etc.* would be needed to produce 5,000 tons of prawns. All the above information established the fact that intensive prawn culture for gaining maximum profit requires supplemented feeds. Enhanced economic benefit from prawn culture in Bangladesh deserves selection of suitable supplemented feeds. Through the present experimentation it might be recommended that flesh of freshwater molluscs, *P. globosa, B. bengalensis* and *L. marginalis* with the indigenous pellet in equal proportion will serve the purpose appropriately. As the experiments revealed that the practices of the same supplemented feed increased the production of *P. monodon* around two times (2.02) which earned 2.12 times profit in comparison to the profit gained from the culture without any supplemented feed.

It may be concluded that economic upliftment of the nation can be achieved through proper exploitation of molluscs of our terrestrial, freshwater and marine habitats in prawn culture farms.

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