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Growth, Survival and Production of *Macrobrachium rosenbergii* (de Man) with an Indigenous Feed

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Abstract : Growth, survival and production of the giant freshwater prawn *Macrobrachium rosenbergii* have been evaluated with an indigenous feed developed at the CIFT. The experiment was conducted in a freshwater pond in the Instructional Farm of the College of Fisheries. After initial preparations, prawn post larvae having an initial size of 20mm/7mg were stocked at the rate of 3 nos/m^2. Theywere fed with crumble feed @ 20% of the body weight for the first fifteen days. Feeding was reduced to 10% of the body weight for the next one month, then to 5% and finally to 2% during the last month. Observations on water temperature, pH, salinity and dissolved oxygen were made at weekly intervals during the culture period. The prawns were harvested at the end of 175 days and a production of 602.5 kg/ha/175 days was obtained. The gross production in the experiment works out to 830 kg/ha/175 days which includes the prawn and *Chanos chanos* which were introduced at a low stocking density in the pond for control of algal blooms. The retrieval rate of the prawns was 79,16%. A conversion ratio of 1.86 was obtained for the feed with the cost of the feed working out to only Rs. 15/kg, since the feed with 40% protein contained only cheap indigenous animal and plant protein ingredients. The net profit works out to Rs. 43, 175/ha with the cost benefit ratio of 2.19.

Introduction

The culture of the giant freshwater prawn is a recent development in India, although it constitutes about 6% of the world prawn production through aquaculture. This species is suitable for culture in most inland water bodies such as lakes, rivers, canals and ponds. Low saline estuarine areas can also be utilised for culturing the species. It is omnivorous in its feeding habits and readily accepts artifical feed. Successful rearing of freshwater prawns necessitates the development of nutritionally balanced artificial feed. In India, detailed research of freshwater prawn nutrition has been taken up only recently when commercial culture of the prawns gained momentum.The types of supplmentary feeds used at present in various growout systems include conventional feeds of different oil cakes and brans, cattle feed available in the market, trash fishes, clam meat, meat offals, different types of pelleted feed, etc. (Anon, 1977; Boonyaratpalin and New, 1982; Ling and Costello, 1976; Subramanyan, 1982; Mathew *et al.*, 1990; Durairaj *et al.*, 1992; Susheela *et al.*, 1992). Many of the feeds are inadequate to meet the nutritional requirements of the prawns. It has been observed that the cost of supplementary feed accounts to nearly 40-60% of the total operational cost of intensive farming operations (Anon, 1983). The exorbitant cost of the feed is a hindrance for its large scale use in prawn farming. Hence formulation of a low cost

nutritionally balanced feed with good conversion ratio and growth is highly warranted. In the present paper an attempt has been made to rear *M. rosenbergii* with an indigenous pelleted feed formulated from locally available cheap protein ingredients.

Materials and Methods

One of the earthen ponds in the instructional Farm of the College of Fisheries was selected for the trial. The pond was dewatered and eradicated of predatory and weed fishes by the application of ammonium sulphate and slaked lime at 60 ppm each. Two days later raw cowdung was applied at the rate of 2,000 kg/ha. Water depth in the pond was maintained at about 75 cm throughout the culture period. Slender cassuarina twigs and cement concrete pipes were provided in the pond for sheltering the prawns. Post larvae of *M. rosenbergii* were obtained from the hatchery of the College of Fisheries and were stocked in the pond at the rate of 3 nos./m^2. The initial size of the prawn post larvae was 20 mm/7mg. Feeding was started on the same day of stocking with crumble feed having 40% protein at the rate of 20% of the body weight and continued for the first fifteen days. Feeding was reduced to 10% of the body weight for the next one month. After this feeding was done at the rate of 5% of the body weight till the end of fifth month, and during the last month of culture feed was reduced to 2% of the body weight. Broadcast feeding was resorted, to provide uniform feeding opportunity to all the prawns. Twenty numbers of *Chanos chanos* having an average size of 120mm/15 g were introduced into the pond during October for control of algal blooms.

Table 1. **Proximate composition (%) of feed**

Moisture	:	5.90
Ash	:	10.20
Protein	:	39.89
Fat	:	7.34
Crude fibre	:	16.17
Carbohydrate	:	20.50

Table 2. **Aminoacid content of feed (g per 16 g nitrogen)**

Aspartic acid	:	10.51
Threonine	:	5.59
Serine	:	4.02
Glutamic acid	:	18.26
Proline	:	4.40
Glycine	:	4.56
Alanine	:	4.58
Valine	:	4.99
Methionine	:	1.30
Isoleucine	:	4.63
Leucine	:	7.31
Tyrosine	:	2.72
Phenyl alanine	:	4.86
Histidine	:	3.27
Lysine	:	4.86
Arginine	:	6.88

Weekly observations on temperature, pH, salinity and oxygen were made during the culture period. Growth assessment of the prawns was done at regular biweekly intervals and the final harvest was carried out at the end of 175 days. Survival, growth and production were worked out and Food Conversion Ratio was calculated.

The proximate composition of the feed and its amino acid profile are given in Tables 1 and 2. Feed formulation, its analysis and production was done at the Central Institute of Fisheries Technology, Cochin.

Table 3. **Monthly range of water temperature, pH, salinity and dissolved oxygen**

Months	Temperature (°C)	pH	Salinity (ppt)	Dissolved oxygen(mg/l)
July 1994 (initial)	28	8.0	0	5
August	28-30	7.5-8.0	0	4-6
September	28.5-31	7-7.5	0	4-5
October	29-30	7.5-8.3	0	3-4
November	30-31	7-75	0-0.5	4-5
December	31-32	7.1-7.5	1.5-2	4-6
January1995	30-32.5	7.2-7.5	2.5-5	4-5

The prawns were stocked in the pond during the month of July when south-west monsoon rains were available in the area. The initial salinity in the pond was 0 while the maximum salinity of 5 ppt was observed in January. Water exchange was done every alternate days in the pond through a screened sluice, but during December and January, it was done only once in a week to prevent the ingress of salinity. The range of water temperature in the pond was between 28-32.5°C, pH 7.0-8.3 and dissolved oxygen 3 to 6 mg/l. The monthly range of water temperature, pH, salinity and dissolved oxygen are given in Table 3. The pond developed *Microcystis* and *Euglena* blooms during the month of October. During this feeding was suspended for one week. A small quantity of *Eichhornia* plants were introduced into the pond for controlling these blooms and twenty number of *Chanos chanos* fingerlings were also introduced for grazing the algal scum. Both these treatments were effective. During the first two months the prawns were of almost uniform size in the sample populations. From the third month onwards, size variation could be noticed in the sample populations. The final mean size was 140mm and 25.368 g and the retrieval rate was 79.16%. The mean growth rate per day was 0.68mm/144.92 mg. The maximum size of the prawns in the experiments was 235 mm/ 140 g while the minimum size was 60mm/5g. Total production of prawns came to 24.1 kg/400m² /175 days which works out 602.5 kg/ha/175 days. Adding the weight of fishes, production was 33.2 kg/400m²/175 days, working out to 830 kg/ha/175 days. The harvested prawns could be graded into three size groups

Table 4. **Details of prawns harvested**

Grade	No. of prawns	% in total number (kg)	Total weight (g)	Mean weight	% in total production
I	570	60	19.950	35	82.78
II	300	31.58	3.750	12.5	15.57
III	80	8.42	0.400	5	1.65

as shown in Table 4. Over 60% of the prawns obtained were of marketable size and contributed to over 82.78 of the production. *Chanos chanos* had growth to an uniform size of 300 mm/305g and 100% retrieval was recorded. The F.C.R. of the feed in relation to the weight of the prawns harvested was seen to be 1.86. Taking into consideration the operational cost and returns through the sale of prawns and fishes, net profit works out Rs. 43,175 /ha/175 days. The details of the input and out put are given in Table 5. The cost of the pelleted feed works out to Rs. 15/kg.

Discussion

The production rates of *M. rosenbergii* in freshwater ponds have been reported as 465-820 kg/ha/ in 199 days (Boonyaratpalin and New, 1982), 280-700 kg/ha in 6 months (Subramanyam, 1982), 630 kg/ha in 6 months (Durairaj *et al.*, 1990), 505.78 kg/ha in 115 days (Mathew *et al.*, 1990). The feeds provided in most of these experiments were conventional feeds consisting of clam meat, trash fish, oil cakes, etc. Menasveta and Piyatiratitivoku (1982) have reported a yield of 925kg/ha/year at initial stocking density of *M. rosenbergii* seed prawn at the rate of 5 nos./m^2. The feed used was fish meal supplemented with rice bran and groundnut oil cake. Though the production rates in the experiments where fresh trash fish, clam meat, groundnut oil cake etc. were used as supplementary feed, seem satisfactory, the cost and ready non-availability of these items may prove to be a hindrance in the large scale farming of the species. Rama Rao *et al.* (1990) cultured *M. rosenbergii* @ 30,000-45,000 nos/ha with supplementary feed made into cake form with 34% protein. The chief protein ingredients used in the feed were minced meat of apple snail, trash fish and de-oiled groundnut oil cake. The feed was offered at 5% of the body weight. The rate of production was between 509-712 kg/ha/175 days obtained in the present experiment, with a daily growth increment 0.68 mm/144.92 mg and a retrieval rate of 79.16% seem to be appreciable taking into consideration the comparatively low production cost of the pelleted feed with a high converstion ratio of 1:1.68. Supplementary feed conversion ratios reported for *M. rosenbergii* are 2.69 to 3.21 (Boonyaratpalin and New, 1982), 1.66 to 2.33 (Smith and Sandifer, 1980) and 2.0 (New, 1988). Durairaj *et al.* (1990) observed higher growth for *M. rosenbergii* fed with pelleted feed in comparison to conventional feed which they attributed to the higher protein content of the feed substituted with vitamins. It may be seen that in the present experiment also, 82.78% of the production on weight basis was constituted by prawn which had reached above 35g and only 1.65% of the production was constituted by prawn having 5 g mean size indicating the utilisation of the pelleted feed by the prawn which is a positive indication of the efficiency of the feed.

A cost benefit ratio of 1.92 has been reported for *M. rosenbergii* culture by Adisukresno *et al.* (1982) and 1.68 by Mathew *et al.* (1990). In the present trial the cost benefit ratio works out to 2.19. Higher benefit could be obtained since 48 nos. of prawns were in berried condition and they were sold at a rate of 50 paise per gram for breeding programme in hatcheries. Rate of return on investment in Thai growout farms is reported to be 108% with feed cost representing about 31% of the total cost (New, 1988).

Table 5. **Details of input and output**

Item	Quantity	Rate (Rs.)	Cost (Rs.)	% in total cost
INPUT				
Prawn juveniles	1200	500/1000	600.00	41.5
Pelleted feed	45 kg	15/kg	675.00	46.7
Labour	2 man days	60/day	120.00	8.3
C. chanos	20	50/100	10.00	0.69
Cow dung	80 kg	Re.1/10 kg	8.00	0.58
Ammonium sulphate &	2.4 kg	Rs. 3/kg		
slaked lime	2.4 kg	Rs. 3/kg	14.40	0.99
Diesel	2.5l	7.04/l	17.60	1.24
Total			1,445.00	100%
OUTPUT				
Prawn Gr.I	18.265 kg	100 / kg	1826.00	
Berried	1.685 kg	50 p/g	842.00	
Prawn Gr.II	3.750 kg	75/ kg	281.00	
Prawn Gr.III	0.400 kg	10/ kg	4.00	
C.chanos	6.100 kg	30/ kg	183.00	
Trash fish	3.00 kg	12/ kg	36.00	
Total	33.20 kg		3,172.00	
Net profit Rs.	3172-1445	= 1,727/-		
Cost benefit ratio		= 2.19		

In the present experiment the prawn seed accounted for 41.5% of the total cost, while feed cost was 46.7% inspite of the low cost of the feed. The rate of returns on investment works out to 119% and the net profit comes to Rs. 43.175/ha, which indicates the lucrative nature of the giant prawn farming even in semi-intensive systems under moderate stocking density.

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