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Evaluation of pink perch (*Nemipterus japonicus*) meat incorporated diet on growth and survival of post-larvae of *Macrobrachium rosenbergii* (de Man)

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Abstract
Macrobrachium rosenbergii post-larvae (PL-5, average weight 10.5 0.21 mg, average length 12.1 0.33 mm) were fed five different diets, diets 1, 2, 3, 4, and 5, each made up of varying amounts of pink perch (*Nemipterus japonicus*) meat powder, with percentages of 20, 25, 30, 35, and 40%, respectively. Other items included in both diets were groundnut oil cake, rice bran, wheat flour, chicken egg, agar, and mineral combination. Four duplicates of each treatment were performed throughout the 30-day experiment, which was carried out in plastic 40-liter tubs. At a stocking density of 2 PL L1, post-larvae were fed 20% of their whole-body weight. In the post-larvae fed on diet-II as compared to other diets, significant (P0.05) results were seen for the biometrics parameters of percentage weight increase (569.34), higher specific growth rate (6.30), higher protein efficiency ratio (2.37) and food conversion ratio (1.075). However, none of the five examined diets significantly differed (p>0.05) in terms of the proportion of post-larvae that survived after being fed.

Keywords: *M. rosenbergii*, post-larvae, growth, pink perch meat

Introduction

India offers an immense amount of promise for the "Scampi" (*Macrobrachium rosenbergii*), a huge freshwater shrimp. The development of hatchery technique for seed production and its successful demonstration in coastal and interior parts of the country are resulting in a rapid expansion of farmers' and business people's expertise of growing this freshwater shrimp (Tripathi 1992) [40]. Due to technological developments in scampi farming and the high returns from this, the farmers have begun monoculture and polyculture with carps in the grow-out ponds. Raje and Joshi (1992) [28] found that scampi respond very well to wide and semi-intensive culture systems. Scampi, which can live in salinities of up to 10 g L-1, may be cultivated as an alternative to tiger shrimp (Penaeus monodon) in low salinity water settings and coastal salt soils, according to Reddy (1997) [30]. However, keeping in mind India's enormous potential aquaculture resources, foreseeable environmental dangers, and the sustainability of prawn farming in the long run. In India, scampi are raised in monoculture and as a component of polyculture on 36,640 acres of land, yielding 39,000 tonnes of fish annually (Lokare and Anis 2000) [19].

The species and stage of development within a species might affect feed requirements, according to studies (Indulkar and Belsare 2001) [16]. Two batches of the same species of prawn aged differently, indicating stunting brought on by a dietary nutritional deficiency (New 1976). It is now difficult to find suitable pelletized feeds made with readily available local ingredients. New (1998) asserts that conventional feed components must be employed to meet the varying needs of different species of prawns and prawns of various sizes, and that their composition must be adjusted to take into account local production, storage, and distribution capacities.

The evaluation of food for *M. rosenbergii* post-larvae reared inside or outdoors in nurseries has received little research, nevertheless (Briggs *et al*. 1988; Heinen and Mensi 1991) [6, 14]. The bulk of studies have focused on the nutritional requirements of adults and subadults. Information is needed for generation of juveniles by limiting nursery expenditures since the cost of rearing nursing juveniles has grown to be a serious problem impacting the profitability of shrimp producers. The present research intended to evaluate the effects of formulated meals created from commonly available, locally available, and low-value kinds of marine fishes in order to develop a post-larval feed that is both economical and easily accessible.

Resources and Procedures

Five-day-old *M. rosenbergii* post-larvae that had been raised in freshwater came from a private hatchery in the Indian district of Sawarde (Chiplun), 415 629. Post-larvae generated by a single female were employed in the experiment.

Pink perch (*Nemipterus japonicus*) meat powder was used in various proportions to make the five compounded flake meals (Diets I–V), with each diet retaining a 40% protein content while employing 20, 25, 30, 35, and 40%, respectively (Indulkar and Belsare 2001) [16]. All other components of each diet were the identical, with the exception of the fish flesh powder. According to Indulkar and Belsare (2001) [16], *M. rosenbergii* post-larvae developed more swiftly on diets with this amount of crude protein, thus the components in each diet were modified to provide between 40% and 60% crude protein. The dry powdered ingredients were weighed in accordance with the prescribed quantities and passed through a 0.5 mm mesh size before being correctly mixed. The required quantity of water-500 ml Kg^{-1}- was then added, and the mixture was again stirred for five minutes. The mixture was cooked to a slurry-like state using steam. The slurry was chilled to room temperature before the required doses of vitamins and minerals were added. The cooled slurry was smeared with a smooth brush in a coating about one millimetre thick over a black polythene sheet and left to sun dry. The sun-dried flakes were removed from the polythene sheet and oven dried at 60 °C for two to three hours to remove moisture. Oven-dried flakes were brought to room temperature, bagged tightly, and stored until testing. Table 1 provides the components in each diet, along with an approximation of how they are made up in compounded diets, by % of dry weight. The standard methods were used to analyse the dietary proximate composition, which included moisture, crude protein, crude fat, and total ash (AOAC, 2005).

In plastic 40-liter containers with 20 litres of water apiece, the experiment was conducted for 30 days. There was a constant 2 L-1 supply of post-larvae (Garces and Heinen 1989) [12]. Four replications of each treatment were performed. Before the experiment started, 50 post-larvae were randomly chosen, and their initial weight and length (From the tip of the rostrum to the telson) were recorded. Reddy (1997) [30] claims that feeding occurred at a rate of 20% of the combined starting body weight of post-larvae. The predicted quantity of feed was distributed in two halves, one in the morning (0800 hours) and the other in the evening (1800 hours). Excreta from post-larvae and remaining feed were disposed of daily. New water was immediately supplied after each time water was syphoned out. About 20 to 30 percent of the water in each container was replenished after each syphoning. The experiment was conducted at room temperature in a lab. Throughout the course of the research, standard methodologies were utilised to daily record typical water properties such pH, temperature, and dissolved oxygen (AOAC, 2005).

Table 1: Composition of feed ingredients in the diets and proximate composition of formulated diets (ingredients on % dry weight basis).

Ingredients	Formulated Diets				
	Diet – I (20%)	**Diet – II (25%)**	**Diet – III (30%)**	**Diet – IV (35%)**	**Diet – V (40%)**
Fish meat	20	25	30	35	40
Prawn shell	25	22.5	20	17.5	15
Wheat flour	25	22.5	20	17.5	15
Ground nut oil cake	10	10	10	10	10
Rice bran	10	10	10	10	10
Poultry egg	10	10	10	10	10
	Proximate composition (% dry weight basis)				
Moisture	6.2	507	6.4	6.8	5.9
Crude protein	39.08	40.95	41.0	41.0	41.70
Crude fat	7.2	6.9	7.0	7.5	7.8
Total ash	13.9	12.8	13.5	15.2	15.7

The prawns in each tub were counted, weighed, and measured at the conclusion of the experiment. One-way analysis of variance (ANOVA) was used to examine the growth and survival data in order to test for any significant variations in mean values. Fisher's protected Least Significant Difference (LSD) test was used to calculate the F-value (p 0.05) to assess if there was a significant difference between the diets (Snedecor and Cochran 1967) [38].

Results

Five diets were made using varied amounts of pink perch powder (20, 25, 30, 35, and %) to standardize the amount of pink perch flesh powder in the post-larval diet. Table 2 provides data on post-larvae growth and survival after 30 days on variously designed diets.

Table 2: Growth and survival of post-larvae of *Macrobrachium rosenbergii* fed with formulated diets.

Particulars	Diet – I (20%)	Diet – II (25%)	Diet – III (30%)	Diet – IV (35%)	Diet – V (40%)
Initial average weight (mg)	11.5+0.21	11.5+0.21	11.5+0.21	11.5+0.21	11.5+0.21
Initial average length (mm)	21.1+0.33	21.1+0.33	21.1+0.33	21.1+0.33	21.1+0.33
Weight after 30 days	57.9+1.04	76.9+2.93	68.9+0.66	62.2+4.21	56.7+0.91
Length after 30 days	20.0+0.24	21.6+0.28	20.0+0.12	21.0+0.09	18.5+0.40
Gain in Weight (mg)	46.2+1.04	65.4+5.36	57.4+0.66	50.7+4.21	45.2+0.91
Gain in Length (mm)	7.9+0.12	9.6+0.28	8.9+0.09	7.9+9.24	6.3+0.49
Percentage gain in Weight	402.5^{a}+9.0	569.3^{c}+46.6	499.3^{bc}+5.7	440.9^{ab}+36.6	393.7^{a}+7.9

Percentage gain in Length	65.7^{b}+1.03	79.27^{c}+2.34	74.3^{c}+0.82	65.32^{b}+2.04	53.45^{a}+3.32
Specific growth rate (% day–1)	5.37^{ab}+0.06	6.30^{d}+0.25	5.96^{c}+0.03	5.60^{b}+0.23	5.31^{a}+0.05
Food conversion ratio	1.48+0.03	1.07+0.10	1.19+0.01	1.38+0.11	1.52+0.02
Protein Efficiency Ratio	1.67+0.03	2.37+0.19	2.08+0.02	1.83+0.15	1.64+0.03
Survival (%)	76.37+0.08	86.50+2.94	70.37+3.73	65.62+3.73	66.25+2.17

The statistics show that the post-larvae's % weight gain for diets 1 through 5 was 402.52, 569.34, 499.34, 440.98, and 393.70, respectively. ANOVA showed a difference in the percentage weight gain of post-larvae fed on several prepared diets with varying percentages of fish meat (p>0.05). The diets that caused the largest weight gain (569.34) were diets II (25% fish meat powder) and III (30% fish flesh powder), respectively. The least amount of weight gain (393.70%) was seen when post-larvae were administered diet-V (40% fish meat powder). LSD (81.95) was used to conclude that there was no statistically significant difference in the percentage weight growth of post-larvae fed on diets II and III, III and IV, and I, IV, and V (p>0.05).

The percentage increases in post-larvae length after 30 days of nursery raising for diets I, II, III, IV, and V were 65.78, 79.27, 74.13, 65.32, and 53.45, respectively. A significant difference in the percentage gain in length was found in the ANOVA (p 0.05). Diet II (25% fish meat) exhibited a much higher percentage length growth (79.27), whereas diet V (40% fish meat) showed a noticeably lower percentage length increase (53.45). The percentage increase in length of post-larvae fed on diets I and IV; II and III did not vary, according to the LSD (6.42) (p>0.05).

The specific growth rates (SGR) (% day-1) of post-larvae fed on different diets for 30 days were discovered to be 5.37, 6.30, 5.96, 5.60, and 5.31 for diets I through V, respectively. An ANOVA revealed that the post-larvae's SGR differed significantly (p0.05) among the diets. The greatest SGR was 6.30, and the lowest SGR was 5.31 in the post-larvae fed diets II (25% fish meat powder) and V (40% fish meat powder). LSD (0.221) revealed no significant differences in SGR between post-larvae given diets I and V (p>0.05). The greatest food conversion ratio (1.07) was found in Diet-II (25 percent fish meat powder). An ANOVA revealed that there were significant differences in the FCR of post-larvae fed on various formulated diets (p0.05). LSD (0.102) indicated that there was no significant difference in the FCR of post-larvae fed on diets I and IV; I and V.

The protein efficiency ratio (PER) peaked in the diet-II (25% fish meat powder) and peaked in the diet-V (40% fish meat powder) at 1.64 and 2.37, respectively. An ANOVA revealed that there were significant differences in the PER of post-larvae fed on various formulated diets (p 0.05). LSD (0.159) showed significantly higher PER in the diet-II. The FCR of post-larvae given diets I and IV exhibited no appreciable change, whereas I and V did not (p>0.05).

65.62 to 86.25 was the range of the average survival percentage. No significant differences were seen in the post-larval survival of post-larvae fed on a variety of specially formulated diets that included varied percentages of pink perch meat powder (p>0.05).

Throughout the experiment, variations in temperature, pH, and dissolved oxygen were observed, ranging from 26.0 to 28.5°C, 6.5 to 7.5 °C, and 5.0 to 6.2 mg L-1, respectively. All water conditions met the tolerance level for *M. rosenbergii* post-larvae, according to New and Singholka (1985) [26].

Discussions

The percentage weight increase of post-larvae for diets 1 through 5 was, according to the results, 402.52, 569.34, 499.34, 440.98, and 393.70, respectively. Post-larvae fed on several prepared meals with various percentages of fish meat showed a significantly different weight gain, according to an ANOVA (p 0.05). Diets II (25% fish meat powder) and III (30% fish meat powder), respectively, were the two that resulted in the biggest weight increases and decreases. The least weight gain (393.70%) was produced by post-larvae when fed Diet-V, which comprises 40% fish flesh powder. The lack of a significant difference in the percentage weight growth of post-larvae fed on diets II and III, III and IV, and I, IV, and V was determined by LSD (81.95) (p>0.05).

The percentage increases in post-larval length for diets I, II, III, IV, and V after 30 days of nursery upbringing were 65.78, 79.27, 74.13, 65.32, and 53.45, respectively. The ANOVA revealed that the percentage increase in length differed significantly from one another (p 0.05). Diet II (25% fish meat) exhibited a notably better percentage length growth (79.27), but diet V (40% fish meat) showed a markedly lower percentage length gain (53.45). The percentage increase in length was the same for post-larvae fed on diets I and IV; II and III, according to the LSD (6.42) (p>0.05).

The specific growth rates (SGR) of post-larvae fed on different diets for 30 days were discovered to be 5.37, 6.30, 5.96, 5.60, and 5.31, respectively, for diets I through V. An ANOVA showed that the post-larvae's SGR differed significantly (p0.05) among the diets. The greatest and lowest SGRs in post-larvae, 6.30 and 5.31, respectively, were seen in diets II (25% fish meat powder) and V (40% fish meat powder). According to LSD (0.221) (p>0.05), the SGR of post-larvae given diets I and V did not differ substantially. The highest food conversion ratio (1.07) was found in Diet-II (25 percent fish meat powder). An ANOVA (p0.05) revealed a significant difference in the FCR of post-larvae fed on various formulated diets. LSD (0.102) indicated that there was no significant difference in the FCR of post-larvae given diets I and IV; I and V.

Protein efficiency ratios (PER) ranged from 1.64 for the diet-V (40%) fish meat powder to 2.37 for the diet-II (25% fish meat powder). According to an ANOVA (p 0.05), the PER of post-larvae fed on various formulated diets differed considerably. LSD (0.159) had a significantly increased PER while on the diet-II. The FCR of post-larvae fed diets I and IV, however, showed no discernible difference between the two diets (p>0.05).

The average survival rate was 65.62 to 86.25 percent. The post-larvae remained unaffected by the several specifically formulated meals administered to them (p>0.05). These diets included varying percentages of pink perch meat powder.

Over the course of the experiment, temperature, pH, and dissolved oxygen all varied between 26.0 and 28.5 °C, 6.5 and 7.5 °C, and 5.0 and 6.2 mg L-1, respectively. All water parameters, according to New and Singholka (1985) [26], were below the tolerance level for *M. rosenbergii* post-larvae.

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