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STUDY ON THE GROWTH OF *MACROBRACHIUM GANGETICUM* JUVENILES FED ON DIFFERENT DIETS IN TANKS WITH AND WITHOUT SOIL-BASE

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The efficacy of two formulated feeds (Feed-I & II) compounded with locally available feed ingredients and one commercial feed (Feed-III) was evaluated on the growth of *Macrobrachium gangeticum* juvenile. The experiments were conducted during January to April 2005 using 1000 l capacity FRP tanks. While one set of tanks was provided with soil-base, the other set was without soil-base. Each tank was stocked with hatchery-produced *M. gangeticum* seed of 3.8 - 4.8 g (90.6-97.6 mm) at density of 50/m^3. Prawns were fed twice daily at 10% of the body weight. Results indicated that units with soil-base exhibited significantly higher ($p<0.05$) weight gain (113.15% in Feed-I; 40.82% in Feed-II; 66.67% in Feed-III) than without soil-base (70.73% in Feed-I; 37.50% in Feed-II; 42.50% in Feed-III). The performance of Feed-I in terms of weight gain and specific growth rate was the best followed by Feed-III and Feed-II.

INTRODUCTION

Macrobrachium gangeticum (Bate) is recognized as third largest growing freshwater prawn and attains weight up to 160 g in the rivers (Tiwari and Holthouis, 1996; Kanaujia *et al*., 2001). In the context of species diversification, the development of seed production in captivity and culture technology is being emphasized. While Kanaujia *et al*. (2001 and 2005) studied various aspects of breeding and seed production, records on the nutritional aspects are limited. Though several formulated prawn feeds are available commercially in India, its high cost make it unaffordable for the rural prawn farmers (New, 1995; Pawase and Shenoy, 1998). Present endeavor is to investigate the growth of *M. gangeticum* juveniles on commercial and formulated feeds reared in tanks with and without soil-base.

MATERIAL AND METHODS

The study was carried out at the Central Institute of Freshwater Aquaculture, Bhubaneswar, India for 120 days during January to April 2005 using 1000 l FRP tanks. Three different feeds were used in two set of feeding trials, each with three replicates. In one set of experimental tanks, soil-base was provided, whereas other was without soil-base. Two formulated feeds prepared in the laboratory using locally available feed-

ingredients *viz*., groundnut oil cake, soybean meal, fish meal, prawn meal, rice bran, starch, vitamins and mineral mixture in the ratio of 4 : 1 : 1 : 1 : 1.8 : 1 : 0.2 (Feed-I) and 3 : 1 : 1 : 1 : 2.8 : 1 : 0.2 (Feed-II) and one commercial feed (Feed-III) was used for feeding prawn juveniles. Proximate analysis of the feeds was done following standard methods (AOAC, 1984). All the tanks were filled uniformly with filtered pond water. Each tank was stocked with *M. gangeticum* seed of 3.8-4.9 g at 50 nos/m^3 of water. The prawns were fed twice daily (at 7-8 am and 6-7 pm) at 10% of the body weight. Metabolites and waste feed was removed daily in the morning. 30% water was replaced with filtered pond water weekly. The water quality parameters *viz*., temperature, pH, dissolved oxygen, total alkalinity, total hardness and dissolved ammonia were analyzed fortnightly following APHA (1981). Average growth was recorded at the end of each month by weighing 30 prawns individually from each tank.

The specific growth rate (SGR) was calculated as: SGR = 100(ln W2 – ln W1)/T, where, W1 is initial mean weight and W2 is final mean weight and T is the time period (days). Feed conversion ratio (FCR) was estimated as: FCR = total feed consumed (g)/ total weight gain of prawn juveniles (g).

The growth data at the end of each month were subject to Duncun's Multiple Range Test to test the significance between the treatments. The 't' test was carried out to find out the significant difference of water quality data between soil-base and without soil-base treatments.

RESULTS AND DISCUSSION

The water quality parameters did not differ significantly within each set of treatment (Table 1), but the variation of data between two sets (with soil-base and without soil-base) was significant ($p<0.05$). Better environmental conditions were recorded in the trial having soil-base. In tanks with soil-base the decomposition of the metabolites and wastes reduced compounds and gases (Radheyshyam *et al.*, 1993 & 2003; Boyd, 1995), might have been adsorbed in the soil-base tanks resulting in better environmental condition.

An appropriate level of dietary lipids is one of the important factors in the palatability of the diets (New, 1987; Paulraj, 1995) and results better growth, survival and feed utilization by the prawns (Indulkar and Belasare, 2003). In present experimental diets the fat level ranged from 4.8 to 6.45 % (Table 2). The level of fat was minimum in Feed-I and maximum in Feed-III, whereas, the protein level was minimum in Feed-III and maximum in Feed-I (42%, Feed-I; 39.2%, Feed-II; 36.75%, Feed-III). Behanan and Mathew (1995) opined that 4-8% lipid level in prawn feed is suitable, while New (1976) and Reddy (1997) reported 6-8% to be ideal for the *M. rosenbergii* larvae.

Table 1. Water quality parameters (mean values) of the experimental tanks with and without soil-base during rearing of *M. gangeticum* provided with different feed

Parameters	Feed-I		Feed-II		Feed-III	
	Soil-base	Without soil-base	Soil-base	Without soil-base	Soil-base	Without soil-base
Temperature (^{0}C)	28.43	28.13	27.67	27.75	27.50	28.00
pH	7.60	8.00	7.70	7.80	7.50	7.80
Dissolved oxygen (mg/l)	4.80	4.20	4.60	4.00	4.40	3.90
Total alkalinity (mg/l)	104.60	112.30	100.40	112.80	104.20	116.70
Total hardness (mg/l)	76.20	80.80	76.40	80.60	76.10	80.80
Dissolved nitrogen (mg/l)	0.20	0.28	0.24	0.28	0.24	0.32

Table 2. Proximate analysis of the experimental diets fed to *M. gangeticum*

Proximate composition	Feed-I	Feed-II	Feed-III
Moisture (%)	5.60	5.40	5.60
Protein (%)	42.00	39.20	36.75
Fat (%)	4.80	5.07	6.45
Ash (%)	13.70	16.51	13.78
Carbohydrate (%)	33.90	33.82	37.42

In general, the dietary lipid, protein and carbohydrate are used for energy by the prawns and in most of the investigations these components are explained as single critical factor, while these components interact (Lim and Persyn, 1989). Hence, their appropriate composition and ratio needs proper attention. In present experimental diets the fat: carbohydrate ratio was 1 : 7, 1 : 6.7 & 1 : 5.7; carbohydrate: protein ratio was 1 : 1.24, 1 : 1.16 & 1 : 1.98; and fat: protein ratio was 1 : 8.81, 1 : 7.7 & 1 : 5.7 in Feed-I, II and III, respectively. Sedgwick (1979) reported decline dietary protein requirement of juveniles if dietary energy is maintained by increasing the carbohydrate or lipid. Cliford and Brick (1978) reported maximized level of protein sparing at 1:4 dietary fat: carbohydrate ratio. The dietary fat: protein ratio in present study indicated that protein content in each experimental diet was adequate to meet the requirements in the rearing *M. gangeticum* juveniles.

Month wise mean weight gain in *M. gangeticum* exhibited increasing trend in all the feeding trials. With few exceptions soil-base tanks had higher monthly weight gain with all the experimental diets (Fg.1). In soil-base tanks the average gain in weight of *M. gangeticum* juveniles was 8.1±1.20, 6.9±1.20 & 6.5±1.90 g on Feed-I, II & III respectively, whereas in without soil-base tanks it was 7.0±1.41, 6.6±1.08 & 5.7±1.25 g on the respective feeds (Table 3). In both the experimental trials the weight gain was highest with Feed-I, probably due to freshness of the feed and higher dietary protein level (42%) in Feed-I as also reported by Hilton *et al*. (1984), D'Abramo (1998) and Indulkar and Belasare (2003).

The percentage weight gain is given in Fig. 2. The soil-base trials showed significantly ($p<0.05$) higher weight gain than the without soil-base trials. On Feed-I, the weight gain over initial weight was higher (113.5%) in soil-base, whereas in without soil-base it was lower (70.73%). In Feed-II it was 40.82% in soil-base and 37.7% in without soil-base. In Feed-III, the soil-base tanks had higher percentage of weight gain (66.67%) than without soil-base (42.5%).

Comparative cumulative SGR of *M. gangeticum* fed on Feed-I, II & III is depicted in Fig. 3. Feed-I indicated highest SGR (0.63% in soil-base; 0.44% in without soil-base tanks) followed by Feed-III and Feed-II.

The FCR is an indicator of feed intake in relation to weight gain and determines the effectiveness of the feed. In present study, the mean FCR of Feed-I, II & III was 2.56, 2.75 and 2.53, respectively in soil-base, whereas, in without soil-base it was 2.63, 2.65 and 2.74 (Table 4). This suggests the suitability of soil-base tank bottom for rearing *M. gangeticum* juveniles.

The commercial feed used for the present study priced at about Rs.29/kg was experienced to be unaffordable to the rural end users (Pawase and Shenoy, 1998), whereas the formulated feeds priced Rs.17/kg for Feed-I and Rs.16/kg for Feed-II could be prepared by the farmers using locally available ingredients. D'Abramo (1990) also suggested to use such locally and regionally derived feed stuffs for the feed formulation. Further, advantage of freshness of the ingredients was the positive influence on digestibility of the ingredients (D'Abramo and Sheen, 1994).

From the present observation it is evident that soil-base tanks provided suitable water quality for better growth, monthly weight gain and specific growth rate of *M.*

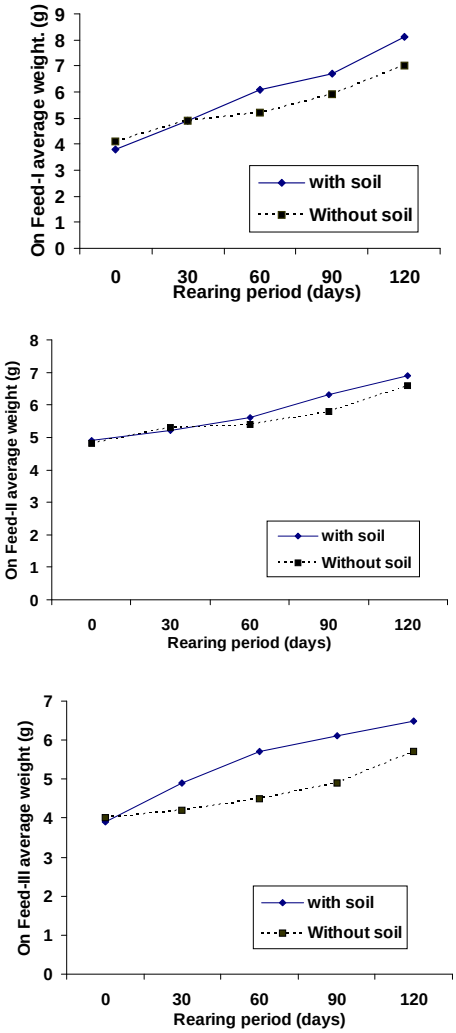

Fig. 1. Monthly weight gain of *M. gangeticum* juveniles in tanks with soil-base and without soil-base fed on different feeds

gangeticum juveniles. Feed-I was found better among other feeds. The advantages of Feed-1 was diet freshness, cost effectiveness, easy accessibility to rural farmers, higher percentage of weight gain over the initial prawn biomass and specific growth rate, compared to commercial feed.

Table 3. Growth trends (weight in g) of *M. gangeticum* fed on formulated feeds (Feed-I & II) and a commercial feed (Feed-III) in tanks with and without soil-base

Days	Feed-I		Feed-II		Feed-III	
	Soil-base	Without soil-base	Soil-base	Without soil-base	Soil-base	Without soil-base
0	3.8±0.79 ^{a}	4.1±0.74 ^{a}	4.9±0.74 ^{a}	4.8±0.63 ^{a}	3.9±0.74 ^{a}	4.0±0.82 ^{a}
30	4.9±0.74 ^{a}	4.9±0.74 ^{a}	5.2±0.92 ^{a}	5.3±0.82 ^{a}	4.9±1.20 ^{a}	4.2±0.92 ^{a}
60	6.1±0.74 ^{b}	5.2±0.92 ^{a}	5.6±1.51 ^{a}	5.4±0.70 ^{a}	5.7±1.42 ^{a}	4.5±0.85 ^{a}
90	6.7±0.95 ^{b}	5.9±0.99 $^{a, b}$	6.3±1.25 ^{b}	5.8±0.92 $^{a, b}$	6.1±1.45 ^{a}	4.9±0.74 ^{a}
120	8.1±1.20 ^{d}	7.0±1.41 $^{b, c, d}$	6.9±1.20 $^{a,b,c, d}$	6.6±1.08 $^{a, b, c}$	6.5±1.90 $^{a, b}$	5.7±1.25 ^{a}

Growth means with different superscript(s) in a row are significantly ($p<0.05$) different

Table 4. Feed conversion ratio of different feed

Month	Feed-I		Feed-II		Feed-III	
	Soil-base	Without soil-base	Soil-base	Without soil-base	Soil-base	Without soil-base
1st	2.31	2.50	2.83	2.71	2.38	2.85
2nd	2.41	2.83	2.79	2.46	2.15	2.79
3rd	3.04	2.64	2.66	2.79	2.79	2.75
4th	2.48	2.53	2.73	2.64	2.81	2.57
Mean	2.56	2.63	2.75	2.65	2.53	2.74

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