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**Showkat Hussain**
Department of Zoology and Applied Aquaculture, Barkatullah University Bhopal, Madhya Pradesh -462026, India

**Neelam Ramteke**
Department of Zoology and Applied Aquaculture, Barkatullah University Bhopal, Madhya Pradesh -462026, India

**Susan Manohar**
Department of Zoology and Applied Aquaculture, Barkatullah University Bhopal, Madhya Pradesh -462026, India

# Growth performance of Freshwater prawn *Macrobrachium lamarrei lamarrei* (H. M. Edward 1837) fed with commercial, supplementary plant and animal feeds

## Showkat Hussain, Neelam Ramteke and Susan Manohar

**Abstract**
The present study was conducted for period of 45 days to investigate the effect of three different diets on growth performance of *Macrobrachium lamarrei lamarrei*. Three separate prawn groups of predetermined weight 0.317±0.010g and length 30±.2mm were fed with three different types of artificially prepared feed Viz, control (commercial feed), supplementary plant feed and supplementary animal feed. The best growth was recorded in animal group fed with supplementary animal feed. The highest mean weight gain and mean length gain were (0.614±0.032g) and (26±2.1mm) in prawns fed with diet-3 (supplementary animal feed). The lowest feed conversion ratio value 0.121±0.141 and highest specific growth rate value 0.594±0.15 % body weight was observed in diet-3 (supplementary animal feed). Further there was a significant difference ($P<0.05$) in values of condition factor. Lowest value of condition factor 0.555±0.008 was found in diet-3.

**Keywords:** Feed conversion ratio, specific growth rate, feeding, animal feed

## 1. Introduction
The progress in aquaculture is directly depends upon the nutritionally balanced feed which provides superior growth within a stipulated time period [1]. The best path for economic farming of various aquatic animals lies in determining the appropriate and precise diet [2] and preparation of low budget artificial feeds from readily available food stuffs [3]. Food and feeding habits play an important role to understand the rate of growth, population density, maturation of gonads and other metabolic activity of aquatic organisms [4, 5]. Feeding is an important function in prawns since growth development and reproduction both release high amount of energy which enters the organisms in the form of food [6]. Proteins form basic and very important macromolecule in diets of the aquatic animals like fish, certain decapods and molluscan [7]. For maintaining and attaining proper growth and reproduction, animals require an optimum level of dietary proteins [8, 9] suggested that nutrient requirement vary from animals to animals and also among different stages of development in some species. There are many studies available about the growth performance and feed strategies of different freshwater prawn species but less literature is available about the growth performance and feeding strategies of the candidate prawn, *Macrobrachium lamarrei lamarrei*. The present study was conducted to estimate growth performance of *M. lamarrei lamarrei* in terms of percentage of weight gain, length gain and specific growth rate, FCR and condition factor fed with three different artificially prepared feeds.

## 2 Material and Methods
**2.1 Study area and duration:** 45 days experiment was conducted from September to October 2016 at Department of Zoology and Applied Aquaculture, Barkatullah University, Bhopal (23.2025°N, 77.4562°E).

**2.2 Collection of test animal and Acclimatization:** Live experimental animals were purchased from the local market near Upper Lake Bhopal. These were transported to university in oxygen bag and were kept in the large vessel. Animals were treated with 0.1 $KMnO_4$ solution to obviate any dermal infection and infestations prior to introducing test animals into experimental aquariums. The prawns were then acclimatized to laboratory conditions.

**Correspondence**
**Neelam Ramteke**
Department of Zoology and Applied Aquaculture, Barkatullah University Bhopal, Madhya Pradesh -462026, India

**2.3 Experimental Design:** To study the growth performance of *M. lamarrei lamarrei*, almost about equal length 30±0.2 mm and weight 0.317±0.010 g prawns were stocked in aquarium at the rate of 20 prawns/aquarium of dimensions 60×30×30cm. Prawns were fed with three different diets once a day for the whole tenure of research work.

**2.4 Water quality monitoring:** Water qualities like temperature, pH, Dissolved oxygen and alkalinity were measured by following protocol of APHA [10].

**2.5 Experimental Diets and feeding regime:** Prawns were fed with control diet-1 commercial feed, diet-2 supplementary plant feed containing soyabean (*Glycine max)* and diet-3 animal feed supplementary prawn meal. Feed were given at the rate of 10% of body weight and formulated by applying Pearson square method. Moisture, protein and lipid content was determined by following protocol of [11, 12, 13] respectively.

**Table 1:** Proximate composition of different diets used in the experiment

| Macromolecules | Diet-1 | Diet-2 | Diet-3 |
|---|---|---|---|
| Protein | 14-15% | 31.70% | 38-40% |
| Carbohydrate | 45% | 32-43.6% | 25-35% |
| Lipid | 4-5% | 15.5-24.7% | 3-7% |
| Cholesterol | 0.6-0.9% | 0.3-0.4% | 0.5-0.6% |
| Ash | 19% | 4.5-6.4% | 5-6% |

**2.6 Growth Measurements**
1. Weight Gain (WG) = Mean final weight (g) - Mean initial weight (g)
2. % weight Gain = Mean final weight (g)-Mean initial weight (g) ×100/ Mean initial weight
3. Length Gain = Mean Final Length (cm) – Mean initial Length
4. % Length Gain = Mean Final Length (cm) – Mean initial Length×100/ Mean initial length Specific growth rate = log of final weight- log of initial weight×100/ No. of Days
5. Condition Factor = Final weight (g) ×100/ Final length$^3$ (cm)
6. FCR = Total feed consumed/ Total yield

**2.7 Statistical Analysis:** The results were calculated and expressed as mean (±SD/range). The whole data was also statistically analyzed using ANOVA (Analysis of Variance). To understand the significant difference in growth performance of prawn fed with different diets.

**3. Result and Discussion**
This experiment is specially designed to assess growth performance of prawn in terms of weight gain (g), % of weight gain, length gain, % of length gain, specific growth rate (% per day), condition factor and feed conversion ratio.
The initial length and weight of the prawns ranged from 29±0.1-30±0.2 mm and 0.310±0.181-0.317±0.010 g respectively in all three aquariums. At the end of study the maximum mean length 55±9.4 mm was observed in the prawn fed with diet-3 and minimum 40±0.45mm in prawns fed with diet-1. While the prawns fed with diet-2 grew up to 46±3.9 mm. Thus as per the present study, prawns fed with diet-3(supplementary animal feed) showed the better growth. Present study result is supported by the findings of [14] in *M. dyanum* that diet with animal protein shows better growth in

comparison to plant protein. The present study is in contrast with [15] that the formulated diets with plant protein perform better than the conventional diet which contains animal ingredients in *M. rosenbergii*. A major reason behind the inferior growth of prawns in plant feed is due to its relatively low protein content [16] low digestibility and anti-nutritional factors of soyabean [17, 18, 19]. Feed conversion ratio was 0.431±0.014, 0.391±0.023, 0.121±0.141 in diet-1, 2 and 3 respectively. The minimum value for FCR was observed in diet-3 and maximum in diet-1. Values of FCR are shown in Fig. 1. There was no significant difference among the values of FCR. Previous findings of [20] found FCR value ranged from minimum 0.31 to maximum 1.274 in 60% and 40% dietary protein in Banana prawn *Fenneropenaeus merguiensis* supports the present study. Further high values of FCR were reported by [7] 2.12 to 1.63 in *Penaeus indicus*. 2.1- 2.2 in shrimp [21]. The mean length gain and mean weight gain and were 10 ± 2.1 < 16 ± 0.8 < 26 ± 2.1 mm, and 0.174 ± 0.005 < 0.235 ± 0.006 < 0.614 ± 0.032 g in diet-1, 2 and 3 respectively. Values of length gain differ significantly ($P<0.05$), while values of weight gain not differ ($P>0.05$) significantly.
The mean specific growth rates were 0.21±0.06, 0.270±0.13, 0.527±0.15 % per day in diet-1, 2 and 3 respectively. SGR values are shown in Fig. 2. There were no significant difference ($P>0.05$) in values of SGR. The highest value was obtained from prawns fed with animal feed, while lowest from commercial feed. Most of the studies showed higher value of SGR. [20] Observed SGR value 1.588 in diet containing 40% protein in Banana prawn. [22] On feeding trails in *M. tenellum* with substituting fish meal with soya meal observed SGR ranged from 1.82±0.67 to 2.62±0.78.
The values of condition factors differ significantly ($P<0.05$) and they were 0.767±0.020>0.561±0.008>0.555±0.008 g/cm³ in diet-1, 2 and 3. Condition factor values are shown in Fig. 3. These orders are reverse to weight gain and specific growth rate. This view is supported by the studies of [3] and [23]. [24] Recommended condition factor and relative condition factor values 1.09 and 1.00 for good condition of *M. rosenbergii* under rice field. In the present study the best growth performance was observed in the prawns fed with diet-3 containing animal byproducts. Hence finally it can be concluded that the animal feed is the best suited feed for growth of prawn *M. lamarrei lamarrei*.
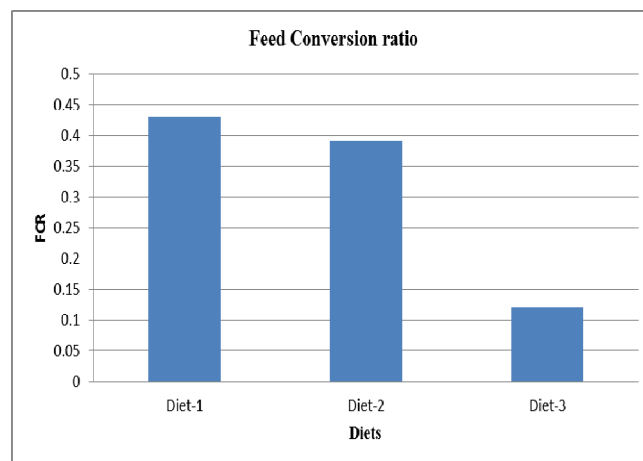


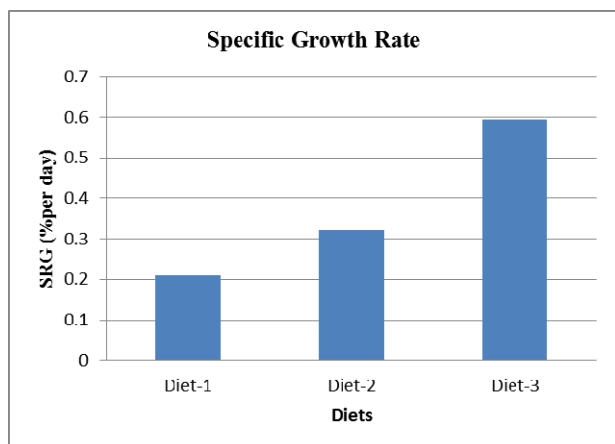**Fig 1:** Comparison of FCR of Prawns fed with different diets during study.

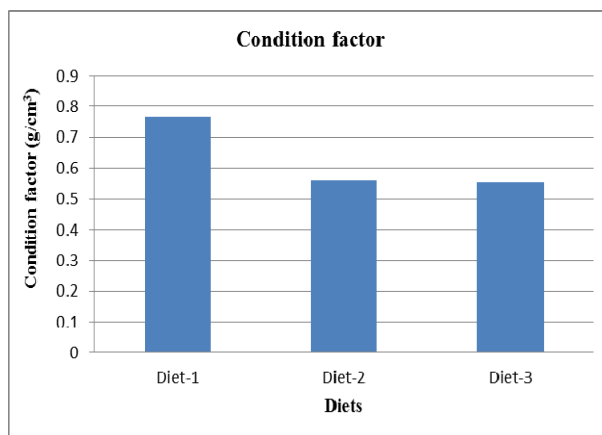**Fig 2:** Comparison between the SGR of prawns feeding on different diets.



**Fig 3:** Comparison between the condition factors of prawns fed with different diets

**Table 2:** Growth performance of prawn *Macrobrachium lamarrei lamarrei* fed with different diets.

| S. No. | Parameters | Control Diet | Experimental diets | |
|---|---|---|---|---|
| | | Diet1 (commercial feed) | Diet-2(Plant feed) | Diet-3(Animal feed) |
| 1. | Initial length(mm) | 30±0.2 | 30±0.2 | 29±0.1 |
| 2. | Final length(mm) | 40±4.5 | 46±3.9 | 55±9.4 |
| 3. | Initial Weight(g) | 0.317±0.010 | 0.312±0.047 | 0.310±0.181 |
| 4. | Final Weight (g) | 0.491±0.045 | 0.547±0.046 | 0.924±0.127 |
| 5. | Weight Gain(g) | 0.174±0.005 | 0.235±0.006 | 0.614±0.032 |
| 6. | Length Gain(g) | 10±2.1 | 16±0.8 | 26±2.1 |
| 7. | % of Length Gain | 33.33 | 53 | 86.66 |
| 8. | % of Weight Gain | 54.88 | 75.32 | 198.86 |
| 9. | SGR (% per day). | 0.21±0.065 | 0.270±0.136 | 0.527±0.157 |
| 10 | Condition Factor(gcm$^{-3}$) | 0.767±0.020 | 0.561±0.008 | 0.555±0.008 |
| 11 | Feed Conversion Ratio | 0.431±0.014 | 0.391±0.023 | 0.121±0.141 |

## 4. Conclusion
The study investigated the effect of different diets on growth performance of freshwater prawn *M. lamarrei lamarrei*. Result indicate that diet-3 (supplementary animal feed) was best feed with regard to the growth measurements, FCR, SGR and condition factor. Thus animal feed is recommended most suitable diet for proper growth of *M. lamarrei lamarrei*.

## 5. Acknowledgement

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