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Study on growth performance of freshwater prawn (*Macrobrachium lamarrei*) reared in two feed sources (Tilapia meat and CP 30%)

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Abstract

The study was organized to investigate the impact of two diets to check out the effectiveness of feed on growth performance of freshwater prawn (*Macrobrachium lamarrei*) at the Saline Water Aquaculture Research Center (SWARC), Muzaffargarh. Two feeding treatments were designed: first treatment group, feed on tilapia meat, initial body weight was 3.73 ± 0.06 g and after 60 days final body weight was 5.48 ± 0.14 g while second treatment group was commercial diet CP 30% at Laboratory conditions. Initial body weight was 3.61 ± 0.06 g and after the end of experiment final body weight was 5.20 ± 0.14 g. The water quality parameters were maintained throughout the experiment: temperature 25.5 °C, dissolved oxygen 5.93 mg/l, pH 7.4 , TDS 3.4 g/l and EC 3.64 μ s/cm. The growth performance was compared in both treatments, results of tilapia meat indicate high growth performance as compared to commercial diet CP 30%. In this study concluded that locally available freshwater prawn *M. lamarrei* is a small size species, gain low body weight and rearing in aquaculture is beneficial if used as live feeds.

Keywords: Freshwater, prawn, different feed, growth performance, live feed

1. Introduction

Crustaceans includes numerous freshwater species of large arthropods including crayfish, lobster, shrimp and prawns which are essential for universal ecosystem provide a key role in food web. Prawns feed on flora and fauna, play a vital role in food chain and frequently used as a delicious feed for carnivorous taxa (Carnevali *et al.*, 2012) [6]. Prawn farming demands on local and International markets, South-east Asia provides 5% production, takes significant impact in aquaculture (Soundarapandian *et al.*, 2009; Tongmee *et al.*, 2021) [21, 24]. Freshwater prawns are potential candidate for aquaculture and are reliable source for vitamin A & D, amino acids and proteins.

Macrobrachium is a most diverse freshwater prawn belongs to Family *Palaemonidae*, regarded as a massively important commercial resource of feed in the crustacean fisheries (Mantelatto and Barbosa, 2005; De Grave and Fransen, 2011; Molina *et al.*, 2020) [15, 8, 16]. *M. lamarrei* is known as "Kuncho river prawn" feed on planktons, algae, fish flesh, decaying plants, and animals, commonly found in freshwater rivers of Pakistan, India, Bangladesh and Nepal (Sharma and Subba, 2005; Ara *et al.*, 2014) [20, 3]. *M. lamarrei* is omnivorous, feeding behavior prefer to cannibalism (feed on dead prawns) as compared to prepared feeds (Kawamura *et al.*, 2018) [11]. The health and growth of farm shrimp's have beneficial effect to ensure profitability, water quality, efficient feed use (Tilapia meat), feed quality and cost, which are important factors that influence growth performance of prawn (Ayisi *et al.*, 2017; Hussain *et al.*, 2017; Lalramchani *et al.*, 2020) [4, 10, 12]. This study was designed to assess quality of diets and efficacy of two diets (Tilapia meat and Commercial diet 30%) in terms of their effective growth on cultured freshwater prawn (*M. lamarrei*). The aim of this study to provide an efficient feed that is cost-effective and rich of protein, which is necessary component of prawn feed (Sankar *et al.*, 2011; Ahmed *et al.*, 2021) [18, 1].

2. Materials and methods

Freshwater prawn (*M. lamarrei*) were collected from Indus River, Taunsa Headworks, District Muzaffargarh and transported in plastic bags with supplied oxygen to Saline Water Aquaculture Research Centre (SWARC). The experiment was designed in freshwater glass aquarium to acclimatized for 7 days. Two feeding treatments were designed, one group fed with tilapia meat and other was on commercial diet CP 30%. Prawns were stocked with density of 20 prawns as per aquarium, various shelter substances (PVC tubes and calcium carbonate stones) were placed in the bottom of the glass aquariums to prevent from cannibalism and fed twice in a day (Sukri *et al.*, 2016) [22]. Waste was siphoned from the tank and water was also regularly changed after every two days during the trial period (Soundarapandian *et al.*, 2009) [21].

2.1. Maintenance of Physico chemical parameters

Physico-chemical parameters *viz*; pH (Apera 8500 pH meter), Temperature, DO (Peak P-512 dissolved oxygen meter), Salinity, TDS and Electrical conductivity (Apera 8500 EC meter) were maintained on daily basis.

2.2. Growth Measurements

1. Weight Gain (WG) = Mean final weight (g) – Mean initial weight (g)
1. % weight Gain = $\frac{\text{Mean final weight (g)} - \text{Mean initial weight (g)}}{\text{Mean initial weight}} \times 100$
2. Length Gain = Mean Final Length (cm) – Mean initial Length
3. % Length Gain = $\frac{\text{Mean Final Length (cm)} - \text{Mean initial Length}}{\text{Mean initial Length}} \times 100$
4. FCR = $\frac{\text{Total feed consumed}}{\text{Total yield}}$ (Hussain *et al.*, 2017)

2.3. Statistical analysis

To understand the significant difference between two different diets on growth performance of prawn and data was statistically analyzed by using ANOVA (Analysis of Variance).

3. Results 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 and feed conversion ratio. The initial length and weight of prawns ranged from 3.0 ± 0.1 – 20 ± 0.2 cm and 3.61 ± 0.06 g– 3.73 ± 0.06 g respectively. Average initial weight on tilapia meat treatment was 3.73 ± 0.06 g, after sixty days was 5.48 ± 0.14 g. Similarly, other CP 30% treatment average initial weight was 3.61 ± 0.06 g, at end of experiment final body weight was 5.20 ± 0.14 g. At the end of study, average length is 5.0 ± 3.4 cm observed in the prawn, fed with tilapia meat and 4.5 ± 0.1 cm length by commercial diet. Feed conversion ratio was minimum 0.6 ± 0.014 with tilapia meat treatment and was maximum 0.8 ± 0.023 with CP 30% as shown in table.1 and Figure 1. There is small significant difference among FCR found during the experiment and lack of previous data available on growth performance of *M. lamarrei*.

Table 1: Growth performance of two diets (Tilapia meat and commercial CP30 %) on *Macrobrachium lamarrei* for 60 days experiment.

Sr. No.	Parameters	Tilapia Meat	Commercial diet CP30%
1.	Initial weight (g)	3.73	3.61
2.	Final Weight (g)	5.48	5.20
3.	Weight gain (g)	1.75	1.59
4.	% of Weight gain	46%	44%
5.	Initial Length (cm)	3.2	3.3
6.	Final Length (cm)	5.0	4.5
7.	Length Gain (cm)	1.8	1.2
8.	% of Length Gain	56%	36.3%
9.	Feed conversion ratio	0.6	0.8

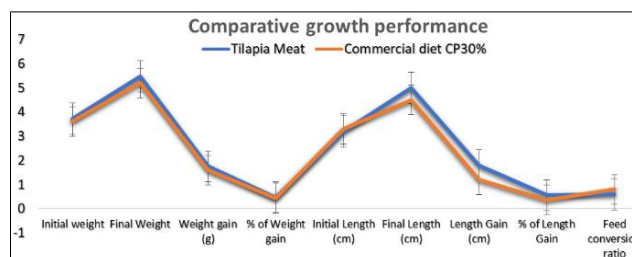


Fig 1: Graph of comparative growth performance by two feeds (Tilapia meat and Commercial diet) in *M. lamarrei* during the sixty days of experiment.

Average water qualities were maintained to culture freshwater Prawn (*M. lamarrei*) as temperature 25.5 °C, pH 7.4, dissolved oxygen 5.93 mg/l, total dissolved solid 3.4 g/l and electrical conductivity 3.64 mS/cm under suitable range as shown in Figure 2. Bhatnagar *et al.*, (2013) [5] describe optimum temperature is 25 – 30 °C while mortality occurs at 14 – 15 °C, and on 36 °C (Valencia *et al.*, 2018) [25]. Santos *et al.* (2019) [19] described optimum water quality parameters as pH 7 to 8.5 is usually optimum for prawn culture, pH less than 7 to 5 effect on growth and development, pH less than 5.0 cause mortality and pH greater than 9.5 dangerous to growth and survival. The levels of protein in feed and aeration also effect on the water quality of the culture system (Anand *et al.*, 2014) [2].

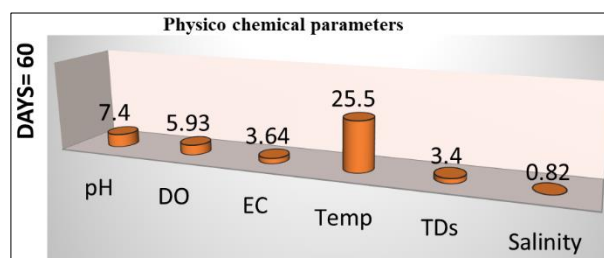


Fig 2: Graph showing average Physico-chemical parameters observed in culture of *M. lamarrei* during the sixty days of experiment during experimental period.

Gomez-Jimenez *et al.* (2005) [9] concluded that there is no change in water parameters in tank-based culture system of *L. vannamei* was fed with 30%, CP proteins. Langer *et al.*, (2011) [14] studies on *M. dyanum* and described similar results that preferred animal protein for growth as compared to plant protein. Lalrinsanga *et al.*, (2012) [13] also supported similar results on length and weight relationship of giant freshwater prawn *M. rosenbergii*. Ayisi *et al.*, (2017) [4] also supported to current studies on *M. lamarrei* provides direct comparison of two diet sources (Tilapia meat and

commercial CP 30%) and preferred Tilapia meat for better growth performance. Tendulkar and Kulkarni, (2011) [23] studies on Banana prawn *Fenneropenaeus merguensis* fed with dietary protein: CP 60% and CP 40%, FCR value was 0.31 and 1.274 respectively. FCR values were also reported in *Penaeus indicus* 1.63 to 2.12 (Cuzon and Aquacop, 1998) [7].

The cannibalistic nature of *M. lamarrei* prefers to feed on tilapia meat and parts of exoskeleton after molting of prawns searched by olfactory appendages (antennules and antennae). Similar behaviors have been observed in *M. rosenbergii* (Patwardhan, 1937; Kuwamara *et al.*, 2018) [17, 11]. In present study best growth performance was observed in the prawns fed with tilapia meat shown best growth as compared to commercial diet CP-30%.

4. Conclusion

A comparative study on growth performance of *M. lamarrei* freshwater prawn was conducted to evaluate the effect of two diets: tilapia meat and commercial diet CP 30%. The result of this study concluded that tilapia meat as culture diet is more effective in growth performance and can compensate in cannibalistic nature in diet. However, *M. lamarrei* is very small freshwater prawn species and commercially crucial in aquaculture if massive production will be used as a live feed in aquaculture.

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