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Growth performance of Freshwater *Labeo rohita* (Hamilton, 1822) fed with commercial, supplementary plant and animal feeds

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Abstract

The present study was conducted to investigate the effect of three different diets on growth performance of *L. rohita* for period of 45 days from September to October 2016 at Department of Zoology and Applied Aquaculture, Barkatullah University Bhopal. Three separate *L. rohita* groups of predetermined weight 3.283-3.609 gm and length 31.9-33.9 cm were fed with three different types of artificially prepared feed viz, control (commercial feed), supplementary plant feed and supplementary animal feed. Among the different treatments *L. rohita* fed with animal origin diet resulted in the maximum body weight gain (25.143gm) and length gain (31.6cm) which was significantly higher than all the treatment which follow the order of preference as plant diet weight gain (12.074gm) and length gain (20.7cm) and commercial diet weight gain (10.918gm) and length gain (14.4cm). The FCR value for animal diet was significantly better than that for plant diet and commercial diet. It was concluded that efficiency of animal diet was better for the growth of *L. rohita* and this supported the inclusion of this ingredient in the diet of fishes.

Keywords: Feed conversion ratio, specific growth rates, *L. rohita*, animal feed

1. Introduction

The aquaculture progress 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 already available food ingredients [3]. Food and feeding habits play an important role to understand the rate of growth, population density, and maturity of gonads and other metabolic functions of aquatic organisms [4, 5]. Feeding is a vital function in aquatic animals 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. The development of fish in culture condition depends up on the availability of essential nutrients, vitamins and minerals [10]. To improve the production process the knowledge of feeding habits of different species is important to understand [11]. Presences of nutrients, minerals and vitamins effect on general growth patterns of fish. These parameters are considered as the basics for growth of the fish. The success of intensive fish culture depends on the formulation of diet that contains an optimum level of protein and energy necessary for the development of fish. Therefore it is necessary to formulate fish feed from locally available feed ingredients. This type of feed preparation from such ingredients should serve as a source of all essential minerals, vitamins, amino acids growth promoting ingredients and energy [12, 13]. There are many studies available about the growth performance and feed strategies of different freshwater fish species but less literature is available about the growth performance and feeding strategies of the candidate fingerlings of *L. rohita*. The present study was conducted to estimate growth performance of *L. rohita* in term of percentage of weight gain, length gain and specific growth rate, FCR and condition factor fed with three different artificially prepared feed.

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2. Material and Methods

2.1 Study area and duration: A 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 (fingerlings) were purchased Patra fish farm, Bhopal. These were transported to university in well oxygenated bags and were kept fibre tanks. Animals were treated with 0.1 KMnO₄ solutions to obviate any dermal infection and infestations prior to introducing test animals into experimental aquariums. The fingerlings were then acclimatized to laboratory conditions.

2.3 Experimental Design: To study the growth performance of fingerlings of *L. rohita* almost about equal length 30±0.2 mm and weight 0.317±0.010 g fingerlings were stocked in aquarium at the rate of 20 fingerlings /aquarium of dimensions 60×30×30cm. Fingerlings were fed with three different diets twice 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^[10].

2.5 Experimental Diets and feeding regime: fingerlings 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 were determined by following protocol of^[11, 12].

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

Macromolecules Diet	1 Diet	2 Diet	3 Diet
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 length³ (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 *L. rohita* fed with different diets.

3. Result and Discussion

This experiment was specially designed to assess growth performance of fingerlings of *L. rohita* in terms of weight gain (g), % of weight gain, length gain, % of length gain, specific growth rate (% per day) and feed conversion ratio. The initial length and weight of the fingerlings ranged from 31.9 to 33.9 cm and 3.609 to 3.289gm respectively in all three aquariums. At the end of study the maximum mean length 31.6cm was observed in the fingerlings fed with diet-2 and minimum 14.4cm in fingerlings fed with diet-3. While the fingerlings fed with diet-1 grew up to 20.7cm. Thus as per the present study, fingerlings fed with diet-2(supplementary animal feed) showed the better growth. Present study result is supported by the findings of^[14] in *L. rohita* that diet with animal protein shows better growth in comparison to plant protein. The result obtained from the^[14, 15] show great resemblance with the present study result in term of growth, FCR and SGR. A major reason behind the inferior growth of fingerlings in plant feed is due to its relatively low protein content low digestibility and anti-nutritional factors of soyabean^[16, 17, 18,]. Feed conversion ratio was 11.732, 5.884, 13.568 in diet-1, 2 and 3 respectively. The minimum value for FCR was observed in diet-2 and maximum in diet-3. Values of FCR are shown in Fig. 1. The mean length gain and mean weight gain and were 14.4 < 20.7 < 31.6 cm, and 10.918 <12.074 < 25.143gm in diet-3, 1, and 2 respectively. The mean specific growth rates were 13.41%, 27.93%, 12.13% per day in diet-1, 2 and 3 respectively. SGR values are shown in Fig. 2. Hence finally it can be concluded that the animal feed is the best suited feed for growth of fingerlings of *L. rohita*.

Table 2: Growth performance of freshwater fish *L. rohita* fed with different diets.

Parameters	Diet T1 (Plant Protein) 38%	Diet T2 (Animal Protein) 38%	Diet T3 (Commercial Feed) 38%
Mean initial weight(g)	3.289gm	3.609gm	3.283gm
Mean final weight(g)	15.363gm	28.752gm	14.201gm
Mean weight gain	12.074gm	25.143gm	10.918gm
% weight gain	78.59%	87.44%	76.88%
Mean initial length	33.9cm	33.7cm	31.9cm
Mean final length	54.6cm	65.3cm	46.3cm
Mean length gain	20.7cm	31.6cm	14.4cm
% length gain	37.91%	48.39%	31.10%
FCR	11.732	5.884	13.568
SGR%	13.41%	27.93%	12.13%
Survival rate	100%	100%	100%

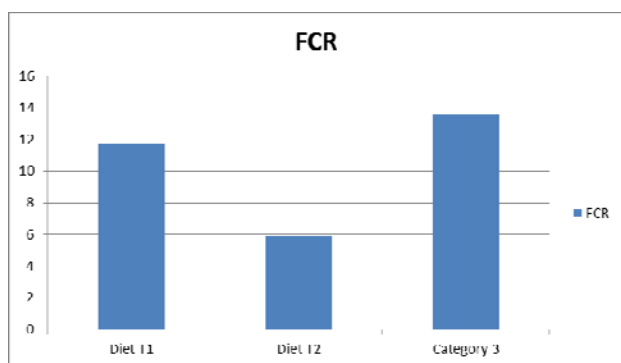


Fig 1: Comparison of FCR of *L. rohita* fingerlings fed with different diets during study.

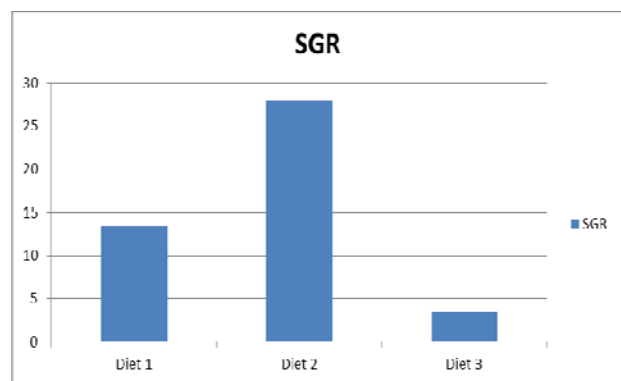


Fig. 2: Comparison between the SGR of *L. rohita* fingerlings feeding on different diets.

4. Conclusion

The study investigated the effect of different diets on growth performance of freshwater *L. rohita* fingerlings. Result indicate that diet-3 (supplementary animal feed) was best feed with regard to the growth measurements, FCR and SGR. Thus animal feed is recommended most suitable diet for proper growth of *L. rohita*.

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