

EFFICACY OF FEEDING FREQUENCY ON GROWTH AND SURVIVAL OF *LABEO ROHITA* (Ham.) FINGERLINGS UNDER INTENSIVE REARING

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ABSTRACT

Effect of feeding frequency on growth and survival of *Labeo rohita* (rohu), during fingerlings rearing was studied in 280 L glass aquaria. Feeding frequency one, two and three times daily as three treatments were evaluated against a control without feeding in triplicate glass aquaria in a trial of 60 days. Single breed fingerlings ranges from Mean length 6.8 ± 0.3 cm, Mean weight 4.18 ± 0.02 g were stocked at the density of 25/aquarium. Survival rate were recorded as 100 %, Similarly, the growth in terms of length and the feed conversion ratio did not differ significantly ($P > 0.05$) among treatments and were in the ranges of 7.92 – 13.6 cm and 1.39 - 1.54 respectively. The study suggests that feeding frequency of three times daily is sufficient for under intensive rearing culture of *Labeo rohita* fingerlings.

Keywords: Feeding frequency; Fingerlings, Growth, Intensive rearing; Survival, Rohu.

INTRODUCTION

The growth in biomass of fish in intensive and semi-intensive culture system depends on various factors notably feeding regimes. Fish growth at different stages is largely governed by the kind of feed, feeding frequency, feed intake and its ability to absorb the nutrients. One problem confronting by fish culturists is to obtain a balance between rapid fish growth and optimum use of the supplied feed. Among these, feeding frequency is an important factor for the survival and growth of fish at the early stage (Hung *et al.*, 2001; Dwyer *et al.*, 2002).

The feeding rate and feeding frequency should be determined for individual feeds and carefully monitored for feed consumption rate and growth period. Optimum feeding frequency may provide maximum utilization of diet. It is evident from earlier studies that excess feeding may lead to leaching of nutrient and limited feeding may suppress growth due to starvation. The fishes should have enough to feed up to satiation for their optimum growth. However, over-feeding leads not only to reduction in feed conversion ratio and increase in input cost but also results in accumulation of wastes that adversely affects the water quality. Time of feeding and feeding frequency have been reported to affect feed intake and growth performance (Neoske and Spieler, 1984) i.e. Indian catfish, *Heteropneustes fossilis* (Sundararaj *et al.*, 1982), rainbow trout, *Oncorhynchus mykiss* (Reddy *et al.*, 1994), Rohu, *Labeo rohita* (Choudhury *et al.*, 2002) and African catfish, *Clarias gariepinus* (Gokcek and Akyurt, 2007).

Therefore, it is important to standardize the feeding frequency and feeding rate for the target species in aquaculture for optimum production. When fish are fed with at optimal feeding frequency, growth and feed

conversion ratio are expected to improve because regulates their feed intake in relation to their energy demand (Kaushik and Meadale, 1994) and their feeding rhythms (Boujard and Leatherland, 1992; Dada *et al.* 2002).

There have been numerous experiments on feeding trial with formulated diets using Indian major carp rohu, *Labeo rohita* which is among the popular and commercially cultured fish species in Pakistan. However reports on experiments regarding feeding frequency of this species are very few (Gokcek *et al.*, 2008). Therefore this experiment has been designed to study the growth response and feed efficiency of Indian major carp rohu, *Labeo rohita* fed on artificial formulated feed (45 % crude protein) named Punjab university diet – 3 (PUD-3) at different feeding frequencies.

MATERIALS AND METHODS

Experimental Studies were carried out at the Fish Biology Lab. University of the Punjab, Lahore, Pakistan between September and October 2008. The impact of feeding frequency on growth and survival of rohu (*L. rohita*) fingerlings was evaluated for 60 days using 280 L glass aquaria. The experimental fish were collected from Government Fish Seed Hatchery, Manawan, Lahore. The specimens acclimated and fed on Rice polish (12.3 % crude protein) @ 5 % body weight for two weeks prior to experiment. Adequate aeration in each glass aquarium water was maintained by using an air pump (Daivo Pump NS 4200). Prophylactic treatment with 0.2 ppm methylene blue solution for first 24 hours was applied in the acclimation aquarium. Single breed fingerlings ranges from initial mean length 6.8 ± 0.3 cm and initial mean weight 4.18 ± 0.2 g were stocked at the

density of 25 Fingerlings/aquarium. Artificial formulated feed (45 % crude protein) named Punjab university diet – 3 (PUD-3) was provided @ 5 % of body weight. Feed ingredients were finely ground and sieved to pass through a 0.5 mm mesh. Proximate composition of feed (Table 1) was determined using standard methods AOAC (1995) before using the diet. Feeding frequency of one, two and three times per day were considered as treatments T₁, T₂ and T₃, respectively. The experiment was carried out in triplicate glass aquaria. The three different treatments were provided at morning 8 h (T₁), 16 h (T₂) and 24 h (T₃) in one, two and three equal splits of the daily ration as per treatment. Growth in terms of length and weight were assessed through weekly samplings. The health status and diet acceptability of the fingerlings were also assessed during the experiment. Water samples from each

dissolved oxygen, pH, total alkalinity, total hardness and free carbon dioxide were recorded by following standard methods (APHA, 1998).

Data Analysis: The values are expressed as means ± SD. The effect of feed frequency on growth parameters were analyzed using one way ANOVA technique and means were compared through LSD test (Steel *et al.*, 1997)..

RESULTS AND DISCUSSION

Physico-chemical parameters such as temperature (28 ± 1 °C), dissolved oxygen (6.7±0.2 mg/L), pH (7±0.5), total alkalinity (419±18), total hardness (148±10) and free carbon dioxide (7.8±0.6 mg/L) in different treatments did not show any marked variations. The recorded parameters in the experiments were within the optimum range for fingerlings rearing (Jena *et al.* 1998 a, b).

The size of fish fingerlings at their early stages usually refers to its length rather than weight due to its practical implications. In this experiment growth in terms of length and weight was significantly higher in all the treatments compared to that of control (Table 2). However, no significant variations in length/weight (P > 0.05) were observed within the treatments.

In present experiment, the maximum growth (Mean length 13.7 cm and Mean weight 26.17 g) was recorded in treatments with three times daily feeding frequency compared to two time feeding frequency 12.9 cm, 23.9 g) and one time feeding frequency (11.9 cm, 23.9 g), while control with no feeding showed minimum growth (7.92 cm, 6.77 g) which was significant (P<0.05).

Table 1 Feed ingredients and proximate composition of the PUD-3 (45 %) feed Statistical analysis Feed Ingredients (%) Proximate composition of feed

Rice Polish	32.26	Moisture (%)	99
Glutton (30 %)	13.41	Lipid (%) dry matter	12.35
Soy bean Meal	2.22	Crude protein (%) dry matter	48.29
Sunflower Meal	3.35	Ash (%) dry matter	8.51
Wheat Bran	3.35	Cost of feed per Kg (Rs.) ¹	34.00
Canola meal	44.40		
Vitamin Premix	1.00		

glass aquarium were collected during 8:00 –9:00 a.m. at 2 - day's interval for analysis of important physico-chemical parameters such as temperature,

Table 2 stocking and harvesting details of *Labeo rohita* fingerlings in treatments with different feeding frequency

Treatment	Replicate	Initial size (cm/g)	Final size (cm/g)	Survival	FCR
Control	1	6.8±0.3/4.18±0.2	7.95±0.02/6.77±0.01	100 %	-
	2	6.8±0.3/4.18±0.2	7.93±0.01/6.63±0.01	100 %	-
	3	6.8±0.3/4.18±0.2	7.88±0.03/6.91±0.01	100 %	-
	Mean	6.8±0.3/4.18±0.2	7.92±0.02/6.77±0.01	100 %	-
T ₁	1	6.8±0.3/4.18±0.2	11.57±0.02/19.64±0.03	100 %	1.41
	2	6.8±0.3/4.18±0.2	11.57±0.06/19.24±0.01	100 %	1.37
	3	6.8±0.3/4.18±0.2	11.57±0.01/19.37±0.02	100 %	1.39
	Mean	6.8±0.3/4.18±0.2	11.57±0.03/19.42±0.02	100 %	1.39±0.04
T ₂	1	6.8±0.3/4.18±0.2	12.61±0.02/22.21±0.03	100 %	1.46
	2	6.8±0.3/4.18±0.2	12.67±0.03/22.61±0.04	100 %	1.43
	3	6.8±0.3/4.18±0.2	12.84±0.01/22.46±0.01	100 %	1.49
	Mean	6.8±0.3/4.18±0.2	12.70±0.02/22.42±0.03	100 %	1.46±0.01
T ₃	1	6.8±0.3/4.18±0.2	13.7±0.1/26.17±0.03	100 %	1.57
	2	6.8±0.3/4.18±0.2	13.6±0.1/27.22±0.01	100 %	1.54
	3	6.8±0.3/4.18±0.2	13.8±0.1/25.94±0.02	100 %	1.52
	Mean	6.8±0.3/4.18±0.2	13.6±0.1/26.44±0.02	100 %	1.54±0.06

In this experiment, treatment (T₃) with three time feeding recorded comparatively higher weight over

treatments with one and two times feeding. The non-significant difference in growth within the treatments in

the experiment infers that differential feeding frequency do not have much influence on growth of the fish in such environment. Similar experimental results that *Labeo rohita* fingerlings perform well when they fed six times in a day were recorded by Choudhury *et al.* (2002). Working on channel catfish fry Murai and Andrews (1976) reported requirement of more frequent meals in small fish for maximum growth. Similarly, Mollah and Tan (1982) and Charles *et al.* (1984) recorded higher growth in *Clarias macrocephalus* and *C. carpio* fry, respectively, fed at higher feeding frequency.

Similar to the growth and survival levels, FCR values also did not show any significant ($P > 0.05$) difference between the three treatments with one, two and three feeding frequency per day. Our observation of FCR is also in agreement with the report of Webster *et al.* (1992) in cage-reared channel catfish and Wang *et al.* (1998) in hybrid sunfish. The findings have practical significance in maximizing the growth and survival of fingerlings by feed managers during fingerlings rearing. It is further inferred that three time feeding may be sufficient in fingerlings rearing.

It was clear that the feed utilization capacity of *L. rohita* fingerlings at 3 times feeding frequency was higher than one or two times feeding. there was a direct relationship between the feeding frequency and growth performance (Table 2). Therefore, it can be concluded that feeding frequency plays a significant role on growth performance of *Labeo rohita* fingerlings to make the feed for its best utilization to increase total biomass.

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