Effect of Supplementary Feed on the Growth and Survival of *Labeo rohita* (Rohu) Postlarvae

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Abstract

The present experiment was carried out in order to compare the growth of *L. rohita* postlarvae (PL) reared in cement tanks and fed with locally available rice bran (RB), a formulated feed (C2) and without any supplementary feeding (FX) as control. Survival and growth of PL were monitored in the tanks. The stocking density was 500 PL m^{-2}. The initial length of PL was from 6.0 - 7.0 mm. The culture cycle lasted 28 days. At the end of the culture cycle the mean length (L_{final}) of fry were 15 mm, 23 mm and 24 mm for FX, RB and C2 respectively. The mean percentage survival at the above feeding treatments were 09%, 62% and 73% respectively. The percentage survival, L_{final} and SGR-L_{final} of fish fed with C2 and RB were not significantly different from each other but they were significantly different from each other in fish reared without supplementary feeding. The results indicate that RB and C2 are preferred for *L. rohita* PL rearing in cement tanks. Due to the availability and low price RB is preferred over C2 as a supplementary feed for *L. rohita* PL rearing.

Introduction

Fish species generally require higher levels of dietary protein for optimum growth than poultry or cattle (Tacon & Cowey 1985). De Silva (1988) however, has shown that in semi-intensive polyculture systems of Indian major carps, daily provision of high protein diets is wasteful. Supplementary feeding is shown to be the highest operating cost in intensive and semi intensive aquaculture (De Silva & Davy 1992).

There is a general trend to replace commercial feed by farm made aquafeeds, ranging from simple mixtures, sometimes made into a doughballs or other forms by hand, to relatively complex paletted feeds (New et al. 1993). Manure application is also an alternative means to provide supplementary feed indirectly because it enhances the growth of natural food organisms. On the other hand, Jana and Chakrabarty (1988) suggested that a better approach to carp culture would be to introduce live plankton rather than direct manuring.

In Asia, where aquaculture is mostly a rural occupation, the selection and utilization of supplementary feeds are linked to other agricultural activities in that particular region. This is so because the bulk of ingredients used as supplementary feeds consist of agricultural by-products or by-products of the animal husbandry industry (De Silva 1993).

Labeo rohita (Rohu) has a unique place in the field of aquaculture in Sri Lanka. It grows well in the medium and minor perennial reservoirs as well as seasonal tanks (Chandrasoma 1986). The optimal utilization of *L. rohita* in freshwater aquaculture in Sri Lanka must be dependent on their postlarval rearing. The rearing of postlarvae (PL) of *L. rohita* at a minimum cost is, therefore, a major factor to be considered. In the present study, an

attempt was made to investigate the effect of locally available rice bran (RB), locally formulated feed (C2) and without supplementary feed, on the growth and survival of *Labeo rohita* (Ham) postlarvae.

Materials and Methods

Nine cement tanks (each in extent 21 m^2) in the Freshwater Fisheries Station premises at Ginigathena were used for this experiment. Experiment lasted for 28 days. Tanks were cleaned, disinfected with bleaching powder, sundried for 24 hours and then filled with water to a depth of 50 cm, from a tributary of the Mahaweli River. The water used was passed through a screen to prevent the entry of unwanted fish and other predatory insects such as May fly (*Caenis* sp., Ephemeroptera) and Dragon fly (*Pantala* sp., Odonata) nymphs.

Each tank was fertilized by mixing 10 kg of fresh cowdung in about 100 l of water in a bucket and then sprinkling it over the water. This was followed by spraying of 0.5 ppm Dipterex after five days to eradicate macro zooplankton (Copepoda and Cladocera) which are too large for the mouth size of PL and to prevent predation on rotifers and perhaps on PL. The following day, 250 ml of kerosene was used to eradicate some of the harmful insects such as back swimmers (*Anisops* sp., Notonectidae) and larvae of diving beetle (*Hydraticus* sp., Dytiscidae). The walls of the cement tanks were scrubbed to remove diving beetle larvae prior to spraying with kerosene. Those that were not killed with kerosene were netted out using a hand net. The tanks were also netted out with a small-mesh net to remove frogs and their eggs. The tanks were then stocked with PL of *L. rohita* of a length range 6.0 - 7.0 mm at densities of 500 PL m^{-2}. The fertilizer application was repeated once in seven days at 50% of the initial amount. This experiment was carried out in triplicate.

Water temperature was measured twice daily in the morning (0600 hrs) and in the evening (1800 hrs). Transparency of water was measured by using a Secchi disc between 1000 to 1100 hrs. pH was determined weekly using a pH meter. Dissolved Oxygen (DO) was determined at two day intervals using Winkler method.

PL in sets of tanks (3 tanks in each set) were assigned three feeding regimes i.e. RB, C2 and FX. Accordingly the three sets of fish tanks were labelled as RB, C2, and FX tanks. At the beginning of the rearing period, the fish in RB and C2 treated tanks were fed with soyamilk for 7 days. The following 2 days fish in C2 tanks were fed with Soyamilk and C2 (1:1 in weight) prepared as a dough made by mixing feed with flour and hot water. The fish in RB treated tanks were also fed with Soya and RB (1:1 in weight) prepared as a dough. Feeding was done twice daily at 0900 hrs and 1600 hrs. Food was placed in feeding trays which were suspended 30 cm under the water surface. The soyamilk, which was prepared by finely grounded soyabean mixed with boiling water, was kept for 30 mins for cooking and then mixed with sufficient tap water. Feeding rate was 2.0 kg soybean powder per 100,000 PL day^{-1}. Soyamilk was splashed all over the pond, twice daily at 0900 hrs and 1600 hrs. During the rest of the rearing period, the fish in C2 treated tanks and in RB treated tanks were fed with C2 and RB respectively. Feeding rate adopted was 5% of the body weight and necessary adjustments were made depending on the feed consumption.

At weekly intervals, three samples of 10 fry from each of the tanks of each feeding regime were taken randomly and their total body lengths were measured immediately after they were killed in 5% formaldehyde.

The specific growth rates for the corresponding lengths (SGR-L) were calculated for each time interval using the following equation (Ricker 1979).

$$SGR\text{-}L = (\ln L_o - \ln L)/(t_2 - t_1)$$

where L_o = initial length L= final length $t_2 - t_1$ = time interval.

In the present study SGR-L for the 1st, 2nd, 3rd and 4th weeks (the entire culture period 28 days) were denoted as SGR-L_7, SGR-L_{14}, SGR-L_{21} and SGR-L_{final}, respectively. The initial lengths of

all PL were of the same range (6.0 - 7.0 mm). SGR-L and % survival rates obtained for the PL reared with the three different feeding regimes were compared using one way ANOVA and Scheffe's test (Zar 1974).

Results

DO, pH and Secchi depth values observed in tanks during the culture period are shown in Table 1. One way ANOVA indicated that secchi depths in the tanks with three treatments were significantly different from each other. Nevertheless, the DO and pH were not significantly different.

The changes in mean length (L) of fry with time at the three feeding regimes are shown in Table 2. One way ANOVA and pair-wise comparison (Sheffe's test; Zar 1974), revealed that the final length (L_{final}) at FX feeding regime was significantly different from L_{final} in other two feeding regimes ($p<0.05$).

Percentage survival rates of *L. rohita* PL reared in the tanks with feeding regimes, C2 and RB were appreciably higher than these in FX tanks (Table 2).

Table 1. Physico-chemical parameters Dissolved Oxygen (DO), pH and Secchi depth in PL-rearing tanks at different feeding regimes (ranges are given in parentheses). Of these parameters DO and pH are not significantly different from each other in tanks with different feeding regimes.

Feeding regime	DO mg l^{-1}	pH	Secchi depth (cm)
FX	5.6	7.5	60^a
	(4.5-7.6)	(6.5-7.8)	(34-80)
RB	6.2	7.6	50^b
	(4.2-8.5)	(6.0-7.7)	(25-80)
C2	5.9	7.5	42^c
	(4.5-7.9)	(6.2-7.9)	(22-80)

Table 2. Mean length (± S.D.) and % survival of *L. rohita* fry at different feeding regimes. Mean lengths of *L. rohita* carrying the same superscript in each sampling interval are not significantly different ($p > 0.05$).

	Mean Length (cm)				
Feeding regime	Day 7	Day 14	Day 21	Final	% survival
FX	$8.02^a \pm 0.54$	$11.23^b \pm 1.38$	$12.42^d \pm 2.22$	$14.75^e \pm 3.59$	09
RB	$9.64^a \pm 0.64$	$14.05^c \pm 1.58$	$16.79^d \pm 2.05$	$23.03^f \pm 5.27$	62
C2	$9.27^a \pm 0.60$	$14.07^c \pm 1.87$	$19.11^d \pm 2.65$	$24.38^f \pm 3.56$	73

The SGR-L throughout the growth period as $SGR\text{-}L_7$, $SGR\text{-}L_{14}$, $SGR\text{-}L_{21}$ and $SGR\text{-}L_{final}$ in weekly intervals are presented in Fig.1. One way ANOVA and sheffe's test revealed that the $SGR\text{-}L_{final}$ in C2 and RB feeding regimes were not significantly different from each other, but significantly different from that in FX.

The coefficient of variation (COV) of length of fish in these different feeding treatments are shown in Fig.2. Higher COV of length was reported for the fish in the FX tanks. The fish in the two the tanks of FX showed the horse running behaviour i.e., fast swimming of fish in schools at the periphery of the cement tank (Li 1989).

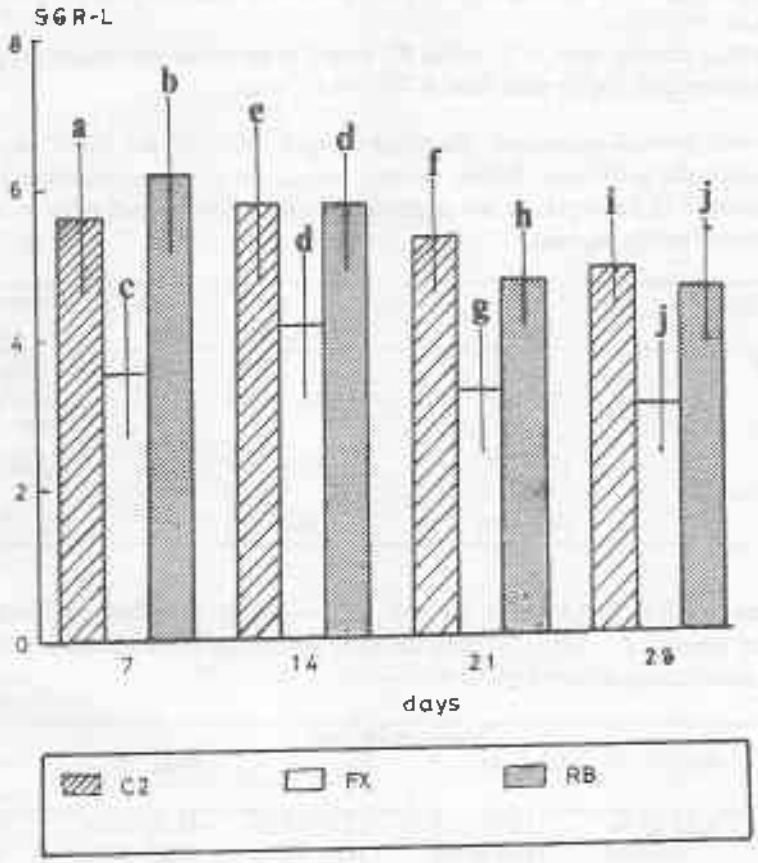

Fig. 1. The specific growth rate in length (SGR-L) in *Labeo rohita* (Rohu) postlarvae reared without supplementary feed (FX), with rice bran (RB), and with formulated feed (c2). Vertival bars - ± SD. In each growth period, the mean SGR-L values with the same letters are not significantly different ($p>0.05$).

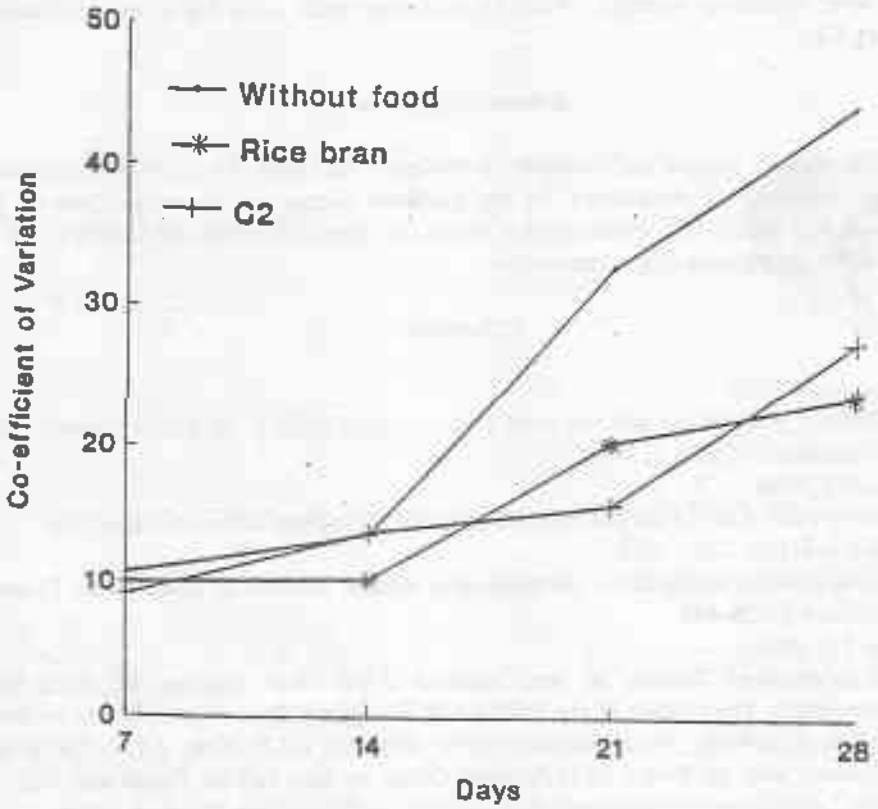

Fig. 2. The coefficient of variation on length of *Labeo rohita* (Rohu) postlarvae reared without supplementary feed, with rice bran and with formulated feed (C2), at different growth periods.

Discussion

Jana and Chakrabarty (1988) have suggested that a better approach to carp culture would be to introduce live plankton. The fish in FX tanks had shown poor growth (Table 2) perhaps due to the amount of natural food present in the tanks were not sufficient for their growths. According to Li Shaoqi (1989), the horse running behaviour as exhibited by fish in FX tanks occurs due to the insufficient feeding. Also greater variation in the length of fish in FX tanks further indicates insufficient food in the FX tanks. Therefore *L. rohita* PL rearing in cement tanks at the stocking density of 500 PL m^{-2} requires supplementary feeding.

On the other hand, the percentage survival, L_{final} and SGR-L_{final} of fish in FX were significantly different from the fish in C2 and RB tanks. It can, therefore, be concluded that the two feeds tested influence the growth of fish (L_{final} and SGR-L_{final}) and percentage survival of *L. rohita* PL. Accordingly, C2 as well as RB could be considered as suitable feeds for *L. rohita* PL rearing. Nevertheless, RB is cheaper than C2 and is locally available in ample amounts in the dry zone. Therefore, rearing *L. rohita* PL in cement tanks using RB is more economical than using C2.

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