Effect of commercial probiotic on the survival and growth performance of fresh water fish *Labeo rohita*

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Abstract: The primary point of this work was to examine the impacts of commercial probiotic on the survival and development execution of goldfish *Labeo rohita*. In this analysis, commercial probiotic was introduced in different diet plans and their dietary impacts were compared with diet that contained no probiotic, which was considered as control. Every treatment was triplicated with 15 fish each and the encouraging preliminary was directed for 30 days. Results demonstrated that, *L. rohita* significantly yielded higher survival rate when it was supplemented with a basal diet with commercial probiotic. Thus, growth performance of *L. rohita* including weight gain (WG) and specific growth rate (SGR) were significantly higher in all treatment than the control diet. Feed Conversion Ratio in fishes that fed with diet containing probiotic was significantly lower than control group. In the mean time, total length was not significantly influenced by the administered probiotic. The most noteworthy and optimum growth performance among treatment was seen in fish benefitted from the diet D1, while the least growth performance was recorded in fish diet from the control diet. The supplementation of dietary probiotics could serve as useful ingredients to upgrade their survival and growth performances.

IndexTerms: Probiotic microbes, Survival Rate, Growth Development, FCR, SGR.

I. INTRODUCTION

Aquaculture, the quickest developing nourishment delivering segment, is seen as having the best potential to fulfil the developing need for amphibian sustenance (FAO). Fish is profoundly nutritious nourishment, containing high measure of protein with high biochemical values for human.

Rohu (*Labeo rohita*) is the most significant among the three Indian real carp species utilized in carp polyculture frameworks. This effortless Indo-Gangetic riverine species is the common occupant of the riverine arrangement of northern and focal India, and the waterways of Pakistan, Bangladesh and Myanmar. Its high development potential, combined with high shopper inclination, have built up Rohu as the most significant freshwater species refined in India, Bangladesh and other adjoining nations in the locale.

Probiotic are live microorganisms that are like valuable microorganisms. Recently, FAO has assigned the utilization of probiotic as a noteworthy operator for the improvement of oceanic ecological quality (Subasinghe *et al*., 2003). Probiotic have just turned into a huge course as an option in contrast to anti-toxin treatment for aquaculture and have been economically accessible as feed or water added substances in lake water (Moriarty 1997; Boyd and Gross, 1998; Verschuere *et al*., 2000; Wang *et al*., 2005). Probiotics have numerous favourable circumstances in aquaculture, For example, balancing microbial colonization, giving supplements, improving immune responses, expanding digestive enzyme activities, improving feed usage and digestibility, controlling diseases, improving water quality and enhance development (Gatesoupe 1999; Verschuere et al., 2000; Iriant and Austin 2002; Pérez-Sánchez *et al*., 2014).

Among the different probiotic bacterial strains, the commercial probiotics like Lactobacillus acidophilus and Lactobacillus sporogenes were utilized in the present investigation. The benefit of these spore-shaped microscopic organisms is that they can endure the palletisation procedure. After travel through the stomach, they sprout in the digestive system and utilize a substantial number of sugars (starches) for their development and produce a scope of significant stomach related chemicals, amylase, protease and lipase.

The beneficial impacts of probiotics incorporate higher development and feed productivity, counteractive action of intestinal disorders and pre-absorption of anti nutritional components present in the ingredients. Besides, the utilization of probiotics for upgrading bio-growth parameters and in improving disease resistant capacity has been very much documented in fish (Watson *et al*., 2008; Wang *et al*., 2006). Hence in the present examination, the new strategy of promoting survival and development of *Labeo rohita* adolescent by utilizing commercial probiotics were examined.

II. MATERIALS AND METHODS

A. Experimental fish: The Indian Major Carp, *Labeo rohita* was chosen for the present investigation. The fish were kept up in a holding rectangular aquarium (100L FRP tanks) with a steady progression of fresh water. The temperature and photoperiod of the culture were kept up. Test fish were acclimatized to these conditions for somewhere around 10 days before the feeding trial.

B. Diet arrangement: Fish feeds ought to have satisfactory vitality for body support and development. It is contributed by three noteworthy supplements specifically protein, fat and sugar. The feeds ought to have nutrient and minerals to meet their insufficiencies and flavours are required in fish diet for brisk utilization and powerful use of feed.

The feed fixings were weighed and blended well in a holder by including adequate amount of refined water and afterwards the ingredients were made into mixture. The mixture was then set in a container and boiled in a pressure cooker for 15 minutes. Subsequent to heating up, the dough was removed from the container and after that vitamins and mineral blend, cod liver oil, were added to the mixture and blended well. The test diet was blended well with commercial probiotics while; the control diet lacked the probiotic supplement.

The mixture was then allowed to pass through a pelletizer and was dried in a hot air oven at a temperature of 50°C over night. At that point the dried pellets were collected and stored in air tight plastic container for further use.

Experimental design: The test tanks (100 L FRP tanks) benefitted by constant air circulation so as to keep up dissolved oxygen near saturation levels. Three experimental groups were conducted to assess the impact of probiotics administrated to the *Labeo rohita* juvenile. Each treatments were assigned with different concentration of probiotic.

Group A was fed with prepared pelleted diet with no probiotics supplementation and was considered as control group. Group B was fed with commercial probiotic mixed diet (1%) and group C was fed with commercial probiotic incorporated directly into water with a concentration of 500ppm.

This examination was performed in triplicate and stocked with 15 fish. The trial was completed for a span of 30 days. While experimentation, fishes were fed with respective diet, two times a day. Each aquarium was cleaned prior to morning feeding by siphoning fish defecation and other natural wastes and half of total water volume was changed with dechlorinated fresh water.

Mortality, external indications of infections and behavioural abnormalities were recorded every day. Every week of sampling, the fish were taken for wet weight and complete length measurement.

C. Indicators of growth includes: Body Weight Increase (BWI), Specific Growth Rates (SGR), Feed Conversion Ratio (FCR), Absolute Growth Rate (AGR), Food Conversion Efficiency (FCE) and Survival Rate (SR) were observed.

The water quality parameters were checked and kept up at an optimum level throughout the whole experimental duration. Water was collected once in 10 days from particular tanks and they were analyzed. Temperature, pH, and dissolved oxygen in culture tanks were estimated and recorded.

D. Growth responses:

To evaluate the growth responses of *Labeo rohita* fed on different diets the following parameters were monitored.

A. Weight

Weight was measured by using electronic balance with least disturbance to the fishes.

B. Production (growth)

Growth (g wet weight) = Final weight – Initial weight

C. Food consumption

Food consumption (g dry weight) = Food provided – Unfed remains

D. Food conversion efficiency (FCE)

$$\text{FCE (\%)} = \frac{\text{Wet weight of the fish produced (g)}}{\text{Dry weight of the feed given (g)}} \times 100$$

E. Absolute growth rate (AGR)

$$\text{AGR (g/body wt/day)} = \frac{\text{Final body weight} - \text{Initial body weight}}{\text{Total number of days}}$$

F. Specific growth rate (SGR)

$$\text{SGR (\%)} = \frac{\text{In final wet weight (g)} - \text{In initial wet weight (g)}}{\text{Experimental period (days)}} \times 100$$

G. Food conversion ratio (FCR)

$$\text{FCR} = \frac{\text{Total amount of feed given (dry weight, g)}}{\text{Total production of fish (wet weight, g)}}$$

E. Biochemical estimation: Biochemical constituents like protein, carbohydrate and lipid were estimated in the muscle tissue of experimental organism fed on different diets at the end of the experimentation.

F. Statistical analysis of the data: The statistical tests used for analysis of data are mean, percentage, frequency, standard deviation, ‘t’ test and ANOVA.

III. RESULT AND DISCUSSION

Growth response: Growth response of *Labeo rohita* benefited from various diets at the end of the experiment is shown in Table 1. A maximum production of 2.36±0.03 was achieved in *Labeo rohita* those fed on D1 though, the minimum production of 0.89±0.02 was attained on fishes those received control diet. In experimental diet D1 (probiotic through diet) and diet D2 (probiotic through water) the production ranged from 2.36±0.03 and 1.15±0.01 separately. The FCR value changed between 1.38±1.01 to 3.538±1.02 separately in various diet fed groups. The FCE was higher 0.78±0.04 in D1 while it was low 0.29±0.01 in control diet supplemented fishes. The SGR was high 7.86±1.04 in D1 fishes whereas; it was low 2.96±1.12 in control diet fed fishes.

As indicated by the Tuan *et al.*, (2013), commercial probiotic was only tested on *Oreochromis niloticus* and never utilized for different species yet. Mehrim (2009) detailed that, addition of 0.3% commercial probiotic to the diet increased the survival rate of tilapia compared with control diet (without commercial probiotic). Abdel hamid *et al.*, (2002) demonstrated that survival rate of Nile tilapia *Oreochromis niloticus* was increased as commercial probiotic level increased from 0 to 0.4%. Comparable results were recorded in this present investigation were, administering probiotic indicates significant improvement and higher survival in all treatments, aside from control.

Survival rate for fish fed on control diet was observed to be 80%. In the mean time, the most elevated percent of survival recorded in D1 was observed to be 100%. The positive result of the commercial probiotic used in this examination may be a result of its effects which fill in as antitoxic, antibacterial and antifungal agents. Ghosh *et al., (*2007) demonstrated that joining of Bacillus species in fish diets less in a fundamentally expanded survival and diminished mortality.

Different investigations have showed that, the utilization of probiotics can improve weight gain, feed conversion ratio, specfic growth rates of salmonids (Merrifield *et al.*, 2010). Supplementation of *Bacillus* spp. brought about noteworthy improvement i.e. Feed Conversion Ratio (FCR), Specific Growth Rate (SGR), Weight Gain and Protein Efficiency Ratio (PER) following 2 months feeding trial in Rainbow trout fry (Bagheri *et al.*, 2008). While, in the present investigation, supplementation of the basal diet with probioic on the *Labeo rohita* juvenile throughout 30 days also resulted in similar higher weight gain, FCR and SGR compared to the control diet as described in Table 1.

Observations of Table 1 expressed that, the best FCR values observed with probiotic contained diet altogether (P<0.01) improved FCR compared to control diet. In practical terms, this means that supplementation of fish diets with probiotics, improves feed utilization or optimized protein use for the growth which can decrease the amount of feed necessary for fish growth, which could result in production cost reductions (Ringo & Gatesoupeb 1998).

Table 1. Growth performance and survival of experimental organism fed on different diets at the end of the experiment.

Growth Index	Control	Diet 1	Diet 2
Production (growth)(g/wet weight)	0.89±0.02	2.36±0.03	1.15±0.01
Food consumption (g/dry weight)	3.149±1.21	3.261±1.32	3.174±1.01
Food conversion ratio (FCR)	3.538±1.02	1.38±1.01	2.76±1.02
Absolute growth rate (AGR) (g/bodyweight/day)	0.029±0.002	0.078±0.003	0.038±0.002
Food conversion efficiency (FCE)	0.29±0.01	0.78±0.04	0.38±0.01
Specific growth rate (SGR) (%)	2.96±1.12	7.86±1.04	3.83±1.02

Survival rate: The survival of *Labeo rohita* fed on different diets during the end of the experimentation is shown in Figure 1. The survival was high 100% in experimental diet (D1), and it was low in the range of 90% in control diet (C) and 80% in experimental diet D2 (Figure 1).

Water quality parameters: During the whole experimental period about 30 days, water temperature ranged from 28ºc to 32°C, dissolved oxygen from 3.2 to 4.6mg L^{-1}, pH from 7.2 to 8.2 and total ammonia from 0.10 to 0.31 mg L^{-1}. The outcomes showed that, the water parameters are in satisfactory level and the experimental diet had no unfriendly impacts on the surrounding water quality of experimental fish (Table 2).

Table 2. Water quality parameters recorded in control tank (C), experimental tank (D1), experimental tank (D2) during experimental duration.

Parameters	Control			D1			D2		
	10th Day	20th Day	30th Day	10th Day	20th Day	30th Day	10th Day	20th Day	30th Day
Temperature	29±0.13	30±0.14	29±0.13	28±0.11	31±0.12	29±0.13	31±0.13	32±o.14	31±0.15
pH	8.1±0.15	8.1±0.17	7.9±0.16	8.2±0.16	8.2±0.19	7.2±0.20	7.9±0.17	8.1±0.16	8.1±0.18
DO (mg/l)	3.2±0.62	3.4±0.71	3.52±0.71	4.09±0.76	3.9±0.49	4.02±0.91	3.61±0.66	3.21±0.76	4.6±0.89
Ammonia	0.10±0.12	0.11±0.14	0.11±0.12	0.11±0.13	0.14±0.17	0.3±0.15	0.12±0.14	0.14±0.17	0.13±0.16

Biochemical parameters: Biochemical constituents recorded in the muscle tissue of *Labeo rohita* fed on various diet towards the end of experimentation is shown in Table 3. The protein content varied from 9.21±0.112 to 11.14±0.134 mg/100mg wet tissue with a highest value obtained by experimental diet D1.

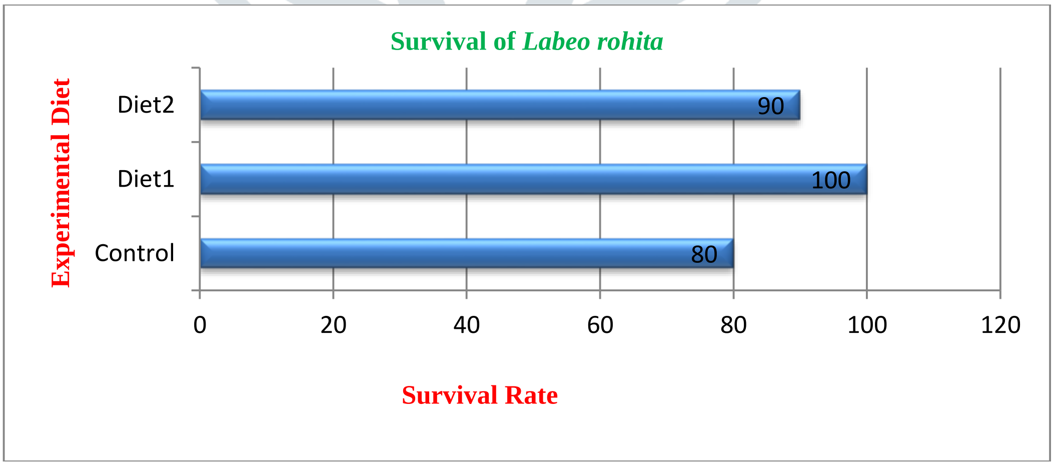
Table 3. Biochemical constituents in the muscle tissue of experimental organism fed on different diets at the end of the experimentation.

Diets	Biochemical Constituents (mg/100mg wet tissue)		
	Protein	Carbohydrate	Lipid
Control	10.26±0.141	1.691±0.144	0.921±0.014
Experimental Diet D1	11.14±0.134	2.893±0.163	1.034±0.021
Experimental Diet D2	9.21±0.112	1.554±0.128	0.904±0.041

A comparative pattern was seen for starch and lipid content too. The carbohydrate content was high 2.893±0.163mg/100mg wet tissues of *Labeo rohita* those received experimental diet D1 and it was low 1.554±0.128mg/100mg wet tissue in fishes those received experimental diet D2.

The muscle lipid content fluctuated between 1.034±0.021mg/100mg wet tissue and 0.904±0.041mg/100mg wet tissue with a maximum value recorded in the control diet fed *Labeo rohita.*

Figure 1. Survival of *Labeo rohita* fed on different diet during the end of the experimentation.



IV. CONCLUSION

In the present examination an attempt was undertaken to survey the impact of various diet, for example control diet (C), experimental diet (D1) and, experimental diet (D2) on growth performance in *L.rohita*. Water quality parameters, growth
responses and tissue biochemical components were analysed. In light of the acquired outcomes, it is prescribed to supplement *L.rohita* diets with probiotics, as natural feed additive substances in their nutritional needs. Therefore, the

utilization of antibiotics in the animal industry could be replaced with probiotics. It can be concluded that the *Lactobacillus acidophilus* and *Lactobacillus sporogenes* species were played a significant role in enhancing the survival, weight gain, FCR and SGR of reared *L.rohita* juvenile.

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