



## RESEARCH PAPER

# Studies on growth performance of *Cyprinus carpio* var. *Communis* fed with *Bacillus clausii* supplemented diets

Sumira Jan\*, Anayitullah Chesti, Madinat Ul. Nisa<sup>1</sup>, Misbah Mushtaq and Shazia Shah

Division of Aquaculture, Sher e Kashmir University of Agricultural Sciences and Technology, Campus Rangil, Ganderbal, Kashmir (J&K) India (Email: [jansumaira92@gmail.com](mailto:jansumaira92@gmail.com))

**Abstract :** The present investigation entitled “Studies on growth performance of *Cyprinus carpio* var. *Communis* fed with *Bacillus clausii* supplemented diets” was carried out at Faculty of Fisheries, Ganderbal over a period of 60 days from April 1<sup>st</sup> to June 1<sup>st</sup> 2019. The fingerlings were fed with dry diets containing three concentrations of probiotic viz., (T<sub>1</sub>: 1%, T<sub>2</sub>: 1.5%, T<sub>3</sub>: 2%) and control group (T<sub>0</sub>: containing no probiotic). The growth parameters including per cent weight gain, Specific growth rate (SGR), feed conversion ratio (FCR), feed efficiency ratio (FER) and protein efficiency ratio (PER) were measured at the end of the experiment. The results showed that the probiotic incorporated diets had significant impact on growth than control group (P<0.05). The highest values of treatment T<sub>2</sub> with 2 per cent probiotic showed the highest percent weight gain (74.62%), specific growth rate (0.40), feed efficiency ratio (0.90), protein efficiency ratio (1.82) were observed in treatments with 2% concentration of probiotic where as, feed conversion ratio(1.09) was lower in groups received probiotic through diets than control.

**Key Words :** *Bacillus clausii*, FCR, SGR, PER, FER

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## INTRODUCTION

Aquaculture is the fastest growing animal production sector in the world, expanding at an average annual rate of 8-11% since 1984 (Pike and Barlow, 2002 and FAO, 2006). India is the second largest producer of fish in the world contributing to 5.68% of global fish production. Aquaculture has been the principle contributor to inland fisheries sector, with the share of 78%. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of

subsidiary industries, and is a source of cheap and nutritious food besides being a foreign exchange earner. *Cyprinus carpio* var. *Communis* is popularly known as scale carp breeds freely in the plains where from, its seeds has been distributed throughout India and its culture popularized (Reddy, 2005). Throughout India common carp is widely distributed and have become the most abundant large freshwater fish in India especially in Jammu and Kashmir, Bangalore, Assam, and Tamil Nadu (Dowal, 1996). Common carp is omnivorous, with a high tendency towards the consumption of animal food, such

\* **Author for correspondence :**

<sup>1</sup>Division of Floriculture and Landscape Architecture, Sher e Kashmir University Of Agricultural Sciences and Technology, Campus Shalimar, Kashmir (J&K) India

| Ingredients (%)         | T <sub>0</sub> | T <sub>1</sub> | T <sub>2</sub> | T <sub>3</sub> |
|-------------------------|----------------|----------------|----------------|----------------|
| Fish meal               | 15             | 15             | 15             | 15             |
| Soybean                 | 16.46          | 16.46          | 16.46          | 16.46          |
| Mustard oil cake        | 16.46          | 16.46          | 16.46          | 16.46          |
| Wheat flour             | 25.04          | 25.04          | 25.04          | 25.04          |
| Rice bran               | 25.04          | 24.04          | 23.54          | 23.04          |
| Vitamin+Mineral mixture | 1              | 1              | 1              | 1              |
| Vegetable oil           | 1              | 1              | 1              | 1              |
| Probiotic               | 0              | 1              | 1.5            | 2              |

as water insects, larvae of insects, worms, molluscs, and zooplankton. It is a tolerant and hardy fish that thrives in a wide variety of aquatic habitats, with optimum temperature range of 23 - 30 C and pH ranges between 6.5- 9.0, respectively. Probiotics have been identified as live microorganisms colonized in the intestine could effect fish health by improving the intestinal microbial balance through feed supplementation (Wang and Wang, 2008 and Dimitroglou *et al.*, 2011). Probiotics improve growth rate in aquatic animals without causing any residual effect and has been considered as an alternative prophylactic method to treat animals including fish either to cure pathogen related diseases or used in preventive treatments (Ringo *et al.*, 2014). The concept of formulation of probiotic based functional feed for fishes/shrimps opens up a new paradigm for the aquaculture industry to increase yield and profit in a sustainable way (Solano and Olmos-Soto 2006 and Olmos *et al.*, 2011). Significant scientific evidences proved that probiotics provide potentially beneficial effects like lactose metabolism, control of gastro intestinal infections, cancer prevention or suppression, cholesterol reduction, stimulation of immunity to the host applied.

In order, to improve growth and health management in aquaculture, probiotics with all the beneficial effects have been seen as potential alternatives therefore, the present study was designed to study the effect of *Bacillus clausii* on growth parameters of Common carp fingerlings with the objective of dose optimization of probiotic (*Bacillus clausii*) and its impact on growth and survival of Common carp (*Cyprinus carpio* var. *Communis*) fingerlings.

## MATERIAL AND METHODS

The experiment was conducted for a period of 60 days from April 1<sup>st</sup> to June 1<sup>st</sup>, 2019 at Fisheries

Instructional Research Farm I of Faculty of Fisheries at Shuhama, Ganderbal.

In the present study, basal diet was prepared by mixing various ingredients in proportion provided with different concentrations of probiotic (*Bacillus clausii*).

Growth performance and feed utilization will be calculated as follows:

$$\text{Weight gain} = W_2(\text{final weight}) - W_1(\text{initial weight})$$

$$\text{Specific growth rate (SGR)} = 100 \times (\ln W_2 - \ln W_1) / T;$$

where,  $W_1$  and  $W_2$  are the initial and final weights and T is the number of days of the feeding period;

$$\text{Feed conversion ratio (FCR)} = \text{feed intake} / \text{weight gain}$$

$$\text{Feed efficiency ratio (FER)} = \text{weight gain} / \text{feed intake}$$

$$\text{Protein efficiency ratio (PER)} = \text{weight gain} / \text{protein intake}$$

The data was statistically analyzed by using statistical package SPSS version 20 in which data was subjected to one way ANOVA.

## RESULTS AND DISCUSSION

Effect of different concentrations of probiotic *Bacillus clausii* incorporated diets showed significant impact on per cent weight gain (%), specific growth rate (SGR), feed conversion ratio (FCR), feed efficiency ratio (FER) and protein efficiency ratio (PER) in Common carp (*Cyprinus carpio* var. *Communis*). Results pertaining to growth parameters is presented in Table 1.

Highest weight gain in percent body weight (74.62%) was recorded in treatment T<sub>3</sub> with 2% probiotic concentration followed by probiotic concentration of 1% and 1.5% with increase in percent weight gain (54.26% and 67.12%), respectively, whereas, lowest per cent weight gain of 41.17% was recorded in control treatment without any application of probiotic during the period of experiment. Similar results were also obtained by Mohapatra *et al.* (2012) worked on effect of probiotic incorporated diets on *Labeo rohita*. The reason might

**Table 1 : Effect of probiotic (*Bacillus clausii*) incorporated diets on growth parameters of common carp (*Cyprinus carpio* var. *Communis*)**

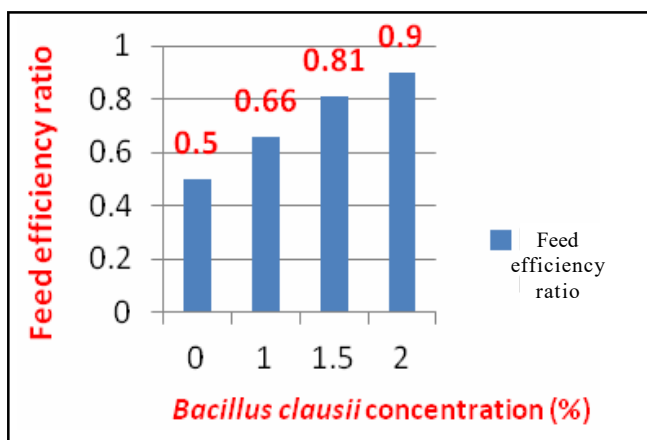
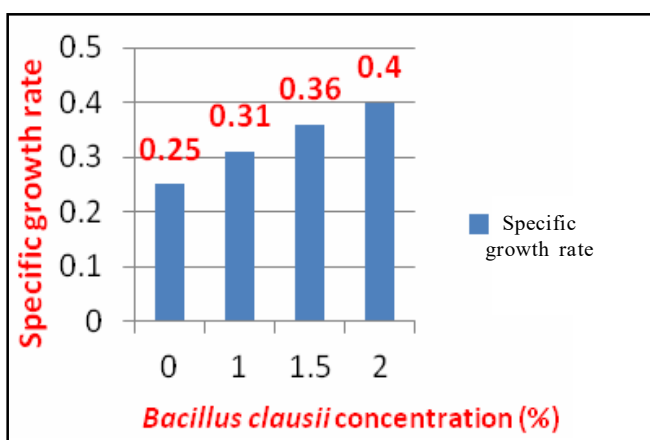
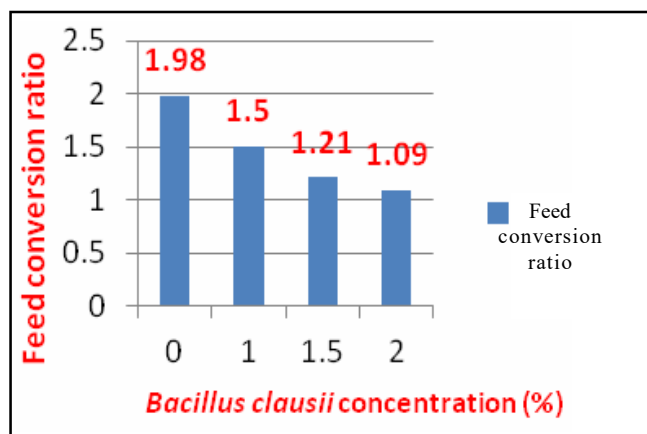
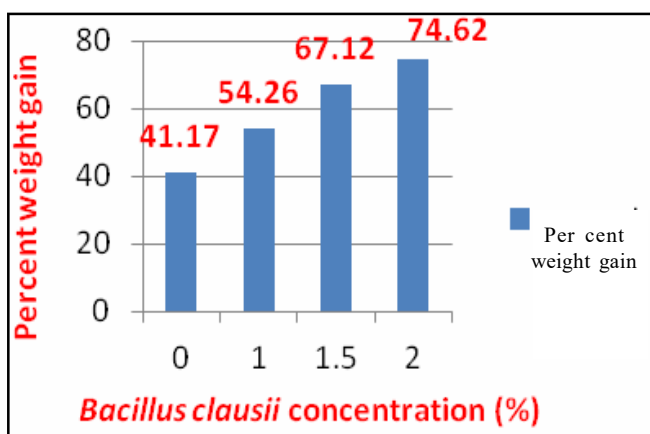
| Treatments     | Per cent weight gain | Specific growth rate(%) | Feed conversion ratio | Feed efficiency ratio | Protein efficiency ratio |
|----------------|----------------------|-------------------------|-----------------------|-----------------------|--------------------------|
| T <sub>0</sub> | 41.17±0.12           | 0.25±0.00               | 1.98±0.00             | 0.50±0.00             | 1.00±0.00                |
| T <sub>1</sub> | 54.26±0.18           | 0.31±0.00               | 1.50±0.00             | 0.66±0.00             | 1.32±0.00                |
| T <sub>2</sub> | 67.12±0.43           | 0.36±0.00               | 1.21±0.00             | 0.81±0.00             | 1.63±0.00                |
| T <sub>3</sub> | 74.62±0.31           | 0.40±0.00               | 1.09±0.00             | 0.90±0.00             | 1.82±0.00                |

T<sub>0</sub>: Control feed without probiotic  
 T<sub>1</sub>: Feed supplemented with 1% probiotic  
 T<sub>2</sub>: Feed supplemented with 1.5% probiotic  
 T<sub>3</sub>: Feed supplemented with 2% probiotic

be that probiotic consumption increases digestive enzyme activity in the gastro intestinal tract of fish and thereby improving nutrient utilization and digestion (Askarian *et al.*, 2011 and Suzer *et al.*, 2008). Highest (0.40%) specific growth rate was recorded in treatment T<sub>3</sub> with 2% probiotic concentration whereas, lowest (0.25%) specific growth rate was recorded in control treatment (T<sub>0</sub>) without any application of probiotic during the period of experiment (Table 1).

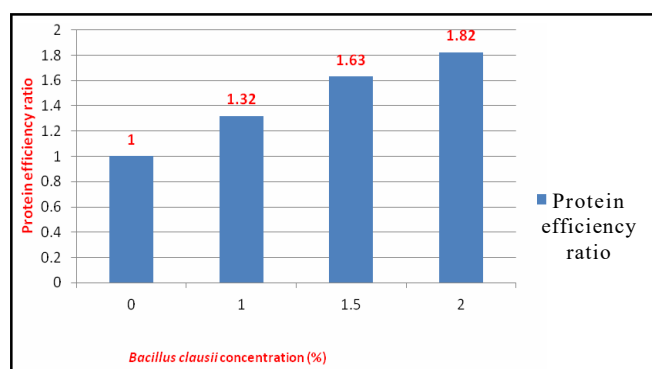
These results are in conformity with Gomezgil (1995) in shrimp (*P. monodon*) larvae and Seenivasan *et al.* (2012) in freshwater prawn (*M. rosenbergii*)

which showed beneficial effects of probiotics on different strains, as application of probiotics are especially used in aquaculture for manipulating the microbial population of the aquatic environment and to mitigate or eliminate pathogenic microorganisms, thereby leading to better specific growth rate and survival of the cultured species (Irianto and Austin, 2002). Highest (1.98) feed conversion ratio was recorded in treatment (T<sub>0</sub>) without any application of probiotic concentration followed by probiotic concentration of 1% (T<sub>1</sub>) and 1.5% (T<sub>2</sub>) with feed conversion ratio of 1.21 and 1.50, respectively, whereas, lowest (1.09) feed conversion ratio was



recorded in treatment ( $T_3$ ) with probiotic concentration of 2% during the period of experiment (Table 1). These results are in conformity with Ramakrishnan *et al.* (2008) who observed improved survival, growth, feed conversion ratio in common carp (*Cyprinus carpio*) fed with probiotics and spirulina. Highest (0.90) feed efficiency ratio was recorded in treatment  $T_3$  with 2% probiotic concentration followed by probiotic concentration of 1% and 1.5% with feed efficiency ratio of 0.66 ( $T_1$ ) and 0.81 ( $T_2$ ), respectively, whereas, lowest (0.50) feed efficiency ratio was recorded in control treatment ( $T_0$ ) without any application of probiotic during the period of experiment (Table 1). It was studied that more the probiotic cells in diets and host intestine necessarily does not result in the more improved growth and survival. Better growth, as observed in 2% concentration may establish better health conditions in rainbow trout fry and therefore, decrease mortality (Rosovitz *et al.*, 1998).

Highest (1.82) protein efficiency ratio was recorded in treatment  $T_3$  with 2% probiotic concentration followed by probiotic concentration of 1% and 1.5% with protein efficiency ratio of 1.32 and 1.63, respectively, whereas, lowest (1.00) protein efficiency ratio was recorded in control treatment ( $T_0$ ) without any application of probiotic during the period of experiment (Table 1). Better efficiency of protein uptake may be due to better digestion and assimilation of the nutrients in the gut by the supplemented micro-flora possibly by virtue of extra cellular enzymes that play an important role in the digestion process as observed in turbot larvae (Munilla *et al.*, 1990).



### Conclusion:

Gram-positive bacteria, including members of the genus *Bacillus*, secrete a wide range of exoenzymes (Moriarty, 1998), which might have supplied digestive

enzymes and certain essential nutrients to promote better growth resulted in enhanced digestion of food and improved growth, including low food conversion ratio (FCR), and high specific growth rate (SGR). High protein efficiency ratio (PER) in probiotic treatments may be due to proteins secreted by members of genus *Bacillus* (Rosvitz *et al.*, 1998).

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