Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(6): 202-206

Received: 19-09-2019
Accepted: 21-10-2019

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Effect of probiotics supplemented diet on growth performance of *Catla catla* fingerlings in tarai region of Uttarakhand

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Abstract
The aim of present work was to investigate the effect of varying levels of Probiotics on specific growth rate (SGR), feed conversion ratio (FCR) and feed conversion efficiency (FCE) of *Catla catla* fingerlings. The fingerlings weighing 10.69±1.09 g were distributed randomly into three treatment groups T1, T2 and T3. Three isonitrogenous diets were prepared by mixing rice polish, deoiled mustard oil cake, maize flour and vitamin mineral mixture. The biomedicine was incorporated into diet D_2 @ 5% and D_3 @ 10%. In control diet D_1, there was no supplementation. T1 group fishes were fed with D_1 diet, T2 with D_2 and T3 with D_3 @ 5% body weight per day for a period of 60 days. Treatment T3 fishes showed significantly better growth performance than those of T2 and control groups T1. Fingerlings fed with diet D3 achieved higher SGR (1.35%±0.02), FCR (1.06±0.02) and FCE (0.93±0.01) as compared to other treatments. The result suggests that the inclusion of the biomedicine probiotic @ 10% in diet of *Catla catla* is useful to get the best fish performance with no harmful effects on the environment.

Keywords: *Catla catla*, probiotic, growth, biomedicine and SGR

Introduction
Nutrition plays a beneficiary role in aquaculture because it influences fish growth and health benefit. Feeding of artificial diet balanced in all nutrients has assumed foremost importance in aquaculture. However, serious losses due to infectious diseases affect fish culture industry. Aquaculture practices have required the advancement of an individual's resistance to infection instead of depending upon antibiotics and chemotherapeutics or immunizations [1]. This action requires high-quality feeds, which should contain not only essential supplements but moreover keep organisms healthy, promote growth and environment-friendly production system and for this reason different added substances are being integrated within the fish feed. In the last several decades, a number of trials have been conducted in different livestock with various indigenous and exogenous useful microorganisms called 'probiotics' to uplift gastrointestinal microflora to fight against infectious diseases[2].
Probiotics are suggested to be a new tool in disease control, growth promotion, and water quality improvement in aquaculture [3]**.** Among probiotic microbes for aquaculture *Bacillus* spp. *Lactobacillus* spp. and *Streptococcal* spp. are more widely utilized and demonstrated to upgrade aqua product health item with no visible side effects [4-7]. Biomedicine used is an optimum blend of feed probiotics and it consists of optimum number of colony forming units, counts of selected strains of *Lactobacillus spp., Bifidobacterium spp., Sterptococcus spp. and Bacillus spp.* which are capable of creating a healthy gut flora in fish. This powerful blend has the strong capability to activate the nonspecific defense mechanism in fish and shrimps. The aim of this study was to assess the effect of different levels of probiotics incorporated diet on weight gain, growth and health of Catla in tarai region of Uttarakhand.

Materials and Methods
Fish collection and maintenance: One hundred and thirty five fingerlings of *Catla catla* with average length 10.6 ± 2.5 cm and average body weight of 12.23 ± 2 g were collected from the Instructional fish farm of College of Fisheries, G.B. Pant university of Agriculture and Technology, Pantnagar, Uttarakhand and were used in the experimental studies. Fish were acclimatized for 15 days in the wet laboratory of Aquaculture department, College of Fisheries under indoor captive conditions in aerated water before experimentation.

During the experimental period the physicochemical parameters (pH, free CO_2, dissolved oxygen, temperature, alkalinity and hardness) of the experimental aquariums were analyzed [8] and the fishes in different experimental groups were monitored periodically.

Experimental setup: Three treatment combinations were made as: T1- Control diet D_1 without biomedicine probiotic, T2 – diet D_2 with 50 g of biomedicine probiotic per kg feed and T3 – diet D_3 with 10g of biomedicine probiotic per kg feed. The experiment consisted of 3 groups with triplicates (3T×3R= 9). Nine equal sized glass aquariums having dimensions 34×15×11 inch with water holding capacity of 92 L were used for the experiment. Each aquarium was stocked with 15 fingerlings of *Catla catla*. Three isonitrogenous diets were prepared by mixing rice polish, deoiled mustard oil cake, corn starch and vitamin mineral mixture (Table 1). The proximate composition of experimental feed is presented in Table 2. The Feeding was done @ 5% body weight per day in two equal instalments for 60 days.

Preparation of experimental feed: Feed was formulated using locally available ingredients deoiled mustard oil cake, rice polish, maize flour and vitamin mineral mixture. Feed was formulated basically by the "Pearson square method" using determined value of protein content of the ingredients. At first, required amount of feed was grounded and later on pellets were prepared with the help of a pelletizer, sun dried to reduce the moisture content to less than 10% [9] and stored at room temperature in sealed plastic container.

Proximate analysis of feed: Proximate analyses of experimental diets were determined by the AOAC method [10]. Moisture content was determined gravimetrically in a hot air oven at 100 ± 10°C for 24 hrs. Crude protein content was determined by the Kjeldahl method. Crude lipid was estimated by extraction with petroleum ether in an electro-thermal Soxhlet apparatus. After extraction of the lipid the defatted samples were used for estimation of crude fibre. Ash content was estimated by muffle furnace at 500 ± 50 °C for 11 hrs.

Table 1: Composition of experimental feed

Sl. No.	Ingredients	Composition of ingredients in 1 kg feed (in gm)
1.	Rice Polish	390
2.	Mustard oil cake	500
3.	Maize flour	100
4.	Vitamin mineral mixture	10
	Total	1000

Table 2: Proximate composition of experimental feed

Sl. No.	Content	Percentage± SD		
		Control (D_1)	Diet (D_2)	Diet (D_3)
1	Moisture	11.00±0.26	10.83±0.26	11.14±0.26
2	Ash	10.10±0.66	10.61±0.66	10.50±0.66
3	Crude protein	25.10±0.71	25.41±0.71	25.70±0.71
4	Crude fat	6.40±0.66	6.33±0.66	6.44±0.66
5	Crude fibre	7.08±0.15	7.16±0.15	7.00±0.15

***Sample collection and analysis*:** Feed was given regularly at daily basis and at the end of the study weight gain of fish (g/fish), Specific Growth Rate (SGR), Feed Conversion Ratio (FCR) and Feed Conversion Efficiency (FCE) were statistically analyzed by one-way ANOVA (SPSS software, version 22) and different treatments were compared by Duncan's test. All data are expressed as mean ± SE.

Calculation of growth parameters

Specific Growth Rate

SGR % = [ln [final weight] - ln [initial weight]/ t (time interval in days)] × 100

Feed Conversion Ratio

Feed conversion ratio is the ratio between mass of food consumed (dry weight) and increase in mass of animal produced.

FCR = Dry weight of feed given in g / Wet weight gain in g

Feed Conversion Efficiency

FCE = Wet weight gain in g / Dry weight of feed given in g

Condition Factor CF

$CF=W/L^3$ X 100, where W is weight in g and L is length in cm.

Results and Discussion

Water quality plays important role in growth and survival of aquatic organisms. It is determined by various physical chemical and biological parameters of water body [11]. The results are in accordance with earlier findings of Nazir *et al* in their study on impact of Biosyn Probiotic as growth promoter in the supplementary feed of an Indian major carp *Labeo rohita* [12]. The water quality parameters such as temperature (19.8-21.5°C), dissolved oxygen (5.4- 6.3 mg/l), pH (7.5-8.0), total alkalinity (175-188 mg/l) and free carbon dioxide (nil-0.2 mg/l) were in optimum range during experimental period.

Table 3: Statistical results of parameters observed

Parameters	Treatments		
	T1	T2	T3
Initial length (cm)	10.21±0.38^a	10.29±0.32^a	10.21±0.27^a
Initial weight (g)	10.68±0.39^a	10.71±0.36^a	10.67±0.37^a
Final length(cm)	11.76±0.37^a	12.36±0.33^a	12.48±0.39^a
Final weight (g)	29.92±0.36^b	34.86±0.55^a	36.13±0.68^a
Weight gain (g)	19.24±0.34^c	24.15±0.29^b	25.45±0.47^a
SGR %	1.14±0.03^b	1.31±0.02^a	1.35±0.02^a
FCR	1.16±0.02^a	1.08±0.01^b	1.06±0.02^b
FCE	0.85±0.01556^b	0.92±0.01122^a	0.93±0.01^a
CF	1.91±0.16^a	1.89±0.14^a	1.94±0.18^a

*Means in the same rows with different superscripts are significantly different (P<0.05).

The results of ANOVA and Duncan's test (Table 3) showed that the final weight fingerlings were significantly different among the treatments. The present study on relative growth performance of *Catla catla* at fingerling stage, in response to diets with varying levels of Probiotics viz. 0, 5, and 10% for a period of 60 days shows that fish fingerlings fed by biomedicine probiotics diet attained good growth, while control diets with no probiotic exhibited least growth.

In the present study, treatment T3 fed diet D_3 containing probiotic 10% led to the highest weight gain among the

treatments fingerlings showing a significant difference with those in T2 and the control group T1 (p<0.05) which similar to the findings of Bogut *et al* and Nikoskelaine *et al* who obtained better growth response with diets supplemented with probiotics containing bacteria [13, 14]. (Fig.1)

The examined treatments were statistically different in the estimates of SGR (P<0.05). Duncan's test revealed that T2 and T3 were significantly dissimilar with the control T1. The treatments mean revealed that the best SGR was recorded in T3 (1.35%), followed by T2 (1.31%) and T1 control (1.14%) (Table 3) (Fig.2). Similarly when probiotics like *Bacillus subtilis* and *B. circulans* were supplemented in the diets of *Labeo rohita* fingerlings, the final body weight and SGR significantly increased than those fed only formulated diets [15].

Fig. 3 shows that FCR in the diet containing 10% probiotics turned out to be the lowest (1.06), representing a significant difference (p<0.05) with treatment T1 control (1.16). The increased growth rate among rohu (*Labeo rohita*) using *Bacillus circulans* extracted from the gut of the fingerlings may again prove the facilitative effects of probiotics on fish growth rates [16]. Meanwhile in a study by Jafari *et al* and Bagheri *et al* probiotic treated group of fish gave a lower FCR compared to non-probiotic treated fish [17, 18].

The highest feed conversion efficiency was recorded in treatment T3 fed with D_3 (diet with 10% Biosyn) which was significantly different from T1 (P<0.05) but not significant from T2. The best FCE was recorded in treatment T3 (0.93) followed by T2 (0.92) and minimum with T1 control (0.85) (Fig.4) Suzer *et al* in his study investigated the influence of commercial probiotic supplementation on the larval stages of Gilthread Sea bream (*Sparus aurata*, L.). Both growth performance and digestive enzyme activities increased in the treatment as compared to control [19].

Condition factor represents condition and health of experimental fish. The highest CF (1.94) was recorded in treatment T3 (diet with 10% Probiotic) (Table 3) Fig. 5 after 60 days of experiment and this concurs with the findings of Opiyo *et al* who reported *Saccharomyces cerevisiae* and *Bacillus subtilis* of feed led to improved growth performance of *Oreochromis niloticus* in low input ponds indicated by better growth rate [20]. The LWR during the culture period indicates that fish fed on Diet D3 had iso- metric growth which is the ideal growth recommended by Froese [21].

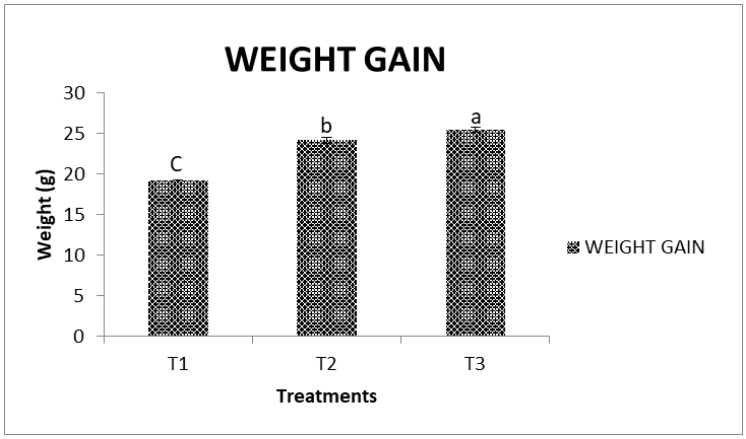

Fig 1: Weight gain in *Catla catla* fingerlings fed with experimental diets.

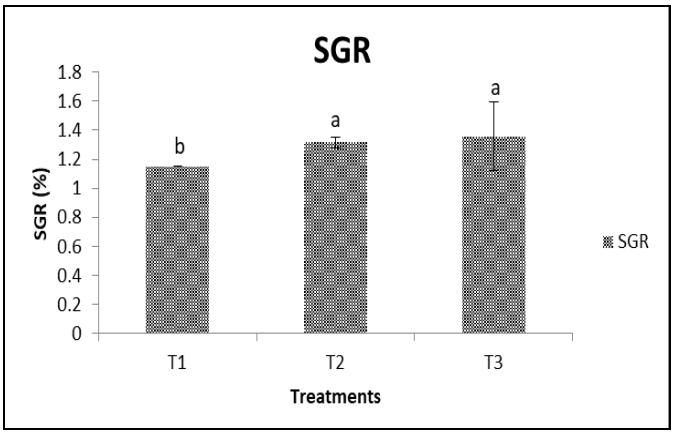

Fig 2: Specific growth rate in *Catla catla* fingerlings fed with experimental diets.

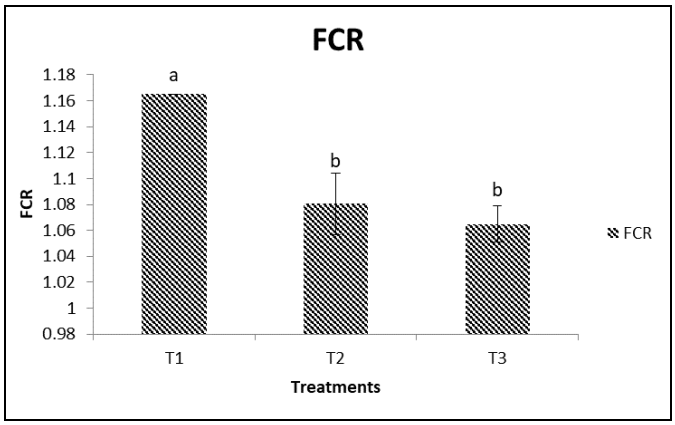

Fig 3: Food conversion ratio in *Catla catla* fingerlings fed with experimental diets.

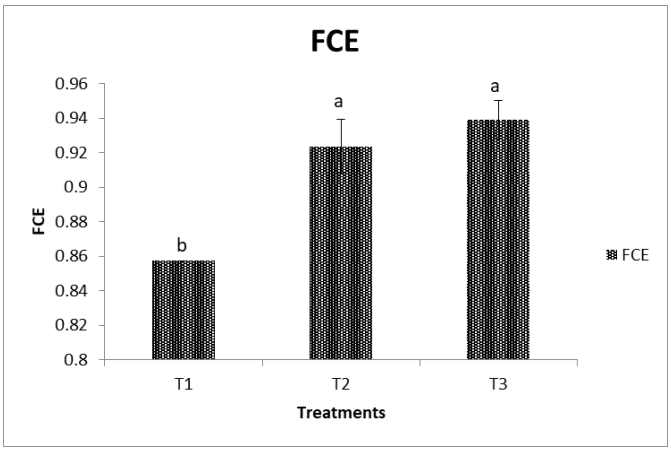

Fig 4: Food conversion efficiency in *Catla catla* fingerlings fed with experimental diets.

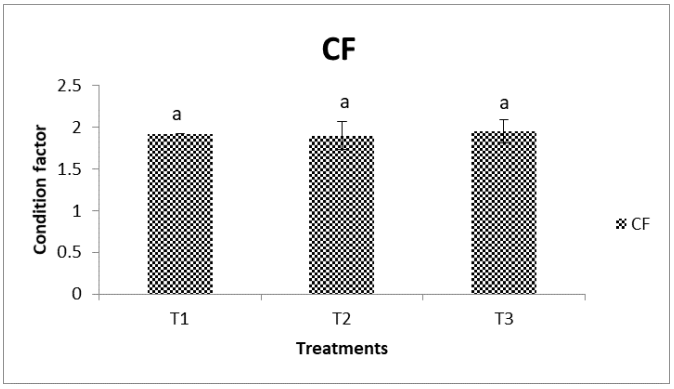

Fig 5: Condition factor in *Catla catla* fingerlings fed with experimental diets.

Conclusion

The results of this study signify that dietary inclusions of Probiotic biomedicine @ 10% in per kg of feed positively affect at most of the parameters examined in the experimental *Catla catla* fingerlings leading to improved growth performance and health. There is no detrimental effect of the probiotics added to feeds on water quality parameters. Further studies should focus on evaluating the efficacy of the probiotics on immunity and health of the *Catla catla* and other culturable fish species.

Acknowledgement

The authors are gratified to the Head, Department of Aquaculture and Dean, College of Fisheries, G.B. Pant University of Agriculture & Technology, Pantnagar for providing Wet laboratory and field facilities for conducting experimental study.

References

1. Kumar R, Mukherjee SC, Prasad KP, Pal AK. Evaluation of *Bacillus subtilis* as a probiotic to Indian major carp *Labeo rohita* (Ham.). Aquaculture Research. 2006; 37:1215-1221.
2. Salminen S, Ouwehand AC, Benno Y, Lee YK. Probiotics: how should they be defined? Trends in Food Science and Technolog. 2019; 10:107-110.
3. Wang YC, Hub SY, Chiud CS, Liu CH. Multiple-strain probiotics appear to be more effective in improving the growth performance and health status of white shrimp, *Litopenaeus vannamei*, than single probiotic strains. Fish and Shellfish Immunology. 2019; 84:1050-1058.
4. Vaseeharan B, Ramasamy P. Control of pathogenic Vibrio spp. by *Bacillus subtilis* BT23, a possible probiotic treatment for black tiger shrimp *Penaeus monodon*. The Society for Applied Microbiology, Letters in Applied Microbiology, 2006; 36:83-87.
5. Balcazar JL, Rojas-Lunab T, Cunningham DP. Effect of the addition of four potential probiotic strains on the survival of pacific white shrimp (*Litopenaeus vannamei*) following immersion challenge with *Vibrio parahaemolyticus*. Journal of Invertebrate Pathology. 2007; 96:147-150.
6. Tseng DY, Ho PL, Huang SY, Cheng SC, Shiu YL, Chiu CS *et al*. Enhancement of immunity and disease resistance in the white shrimp, *Litopenaeus vannamei*, by the probiotic, *Bacillus subtilis* E20. Fish Shellfish Immunology. 2009; 26:339-344.
7. Liu KF, Chiu CH, Shiu YL, Cheng W, Liu CH. Effects of the probiotic, *Bacillus subtilis* E20, on the survival, development, stress tolerance, and immune status of white shrimp, *Litopenaeus vannamei* larvae. Fish Shellfish Immunology. 2010; 28:837-844.
8. APHA. Standard methods for the examination of water and waste water, 21st edn. American Public Health Association, Washington, DC, 2005.
9. Liu CH, Wu K, Chu TW, Wu TM. Dietary supplementation of probiotic, *Bacillus subtilis* E20, enhances the growth performance and disease resistance against *Vibrio alginolyticus* in parrot fish (*Oplegnathus fasciatus*). Aquaculture International, 2017; 26(1): 63-74.
10. AOAC (Association of Official Analytical Chemists). Official methods of analysis of AOAC International, 17th edition. AOAC International, Gaithersburg, Maryland, USA, 2000.
11. Arya P, Nazir I, Chauhan RS. Evaluation of growth performance in fingerlings of Indian major carp *Labeo rohita* fed with nutraceutical Stimulin incorporated diets. Journal of Environmental Bio-Sciences. 2016; 30(1):197-200.
12. Nazir I, Arya P, Chauhan RS. Evaluation of growth promoting potential of probiotic Biosyn in fingerlings of Indian major carp *Labeo rohita*. National Journal of Life Science, 2015; 12(2):173-175.
13. Bogut I, Milakovie Z, Bukvic Z, Brikie S, Zimmer R. Influence of probiotic (*Streptococcus faecium* M74) on growth and content of intestinal microlora in carp (*Cyprinus carpio*). Zivocisna-vyrob. 1998; 43:231-235.
14. Nikoskelaine S, Ouwehand A, Salminen S, Bylund G. Protection of rainbow trout (*Oncorhynchus mykiss*) from furunculosis by *Lactobacillus rhamnosus*. Aquaculture, 2001; 198:229-236.
15. Bairagi A, Ghosh KS, Sen SK, Ray AK. Evaluation of the nutritive value of *Leucaena leucocephala* leaf meal , inoculated with fish intestinal bacteria *Bacillus subtilis* and *Bacillus circulans* in formulated diets for rohu, *Labeo rohita* (Hamilton) fingerlings. Aquaculture Research. 2004; 35:436-446.
16. Ghosh K, Sen SK, Ray AK. Growth and survival of rohu, *Labeo rohita* (Hamilton) spawn fed diets supplemented with fish intestinal microflora. Acta Ichthyologica et Piscatoria, 2002; 32(1):83-92.
17. Jafari KK, Emamgholi A, Askarian F. The use of the Yeasture and Belugatex I, II as probiotics on growth parameters and survival of rainbow trout, *Oncorhynchus*

mykiss larvae. Journal of Fisheries, 2011; 5(4):1-16.
18. Bagheri BM, Faghani LH, Tolooei MH, Samiei MH. A survey of bactocell effect on bio-factors of *Huso huso* fingerlings. Quarterly Breeding and Aquaculture Sciences Journal. 2013; 1(1):21-34.
19. Suzer C, Çoban D, Kamaci HO, Saka Ş, Firat K, Otgucuoğlu Ö *et al*. *Lactobacillus* spp. Bacteria as probiotics in gilthead sea bream (*Sparus aurata* L.) larvae: Effects on growth performance and digestive enzyme activities. Aquaculture. 2008; 280:240-245.
20. Opiyo MA, Jumbe J, Ngugi CC, Charo-Karisa H. Different levels of probiotics affect growth, survival and body composition of Nile tilapia (*Oreochromis niloticus*) cultured in low input ponds. Scientific African. 2019; 4:e00103. doi: 10.1016/j.sciaf.2019.e00103.
21. Froese R. Cube law, condition factor and weight-length relationships: history, meta-analysis and recommendations. Journal of Applied Ichthyology. 2006; 22:241-253.