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Effect of Synbiotic (*Biomin imbo*) on Growth Performance and Survival Rate of Texas Cichlid (*Herichthys cyanoguttatus*) Larvae

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Abstract: The effects of synbiotic (*Biomin imbo*) on growth performance and survival rate of Texas cichlid larvae (*Herichthys cyanoguttatus*) were studied for 90 days. Fish were randomly allocated in 12 aquaria (10 fish per aquarium) and triplicate groups of Texas cichlid (initial weight 0.5±0.11g) were fed with supplemented Biomar. The larvae in control treatment were fed without supplemented Biomar. three levels of Biomar experimental diets were prepared by adding synbiotic (0.5, 0.75, 1 g/Kg) at the basal diet (Biomar) and the Texas cichlid larvae in experimental treatments were fed of the three levels of synbiotic with 5 percent body weight (3 times a day). The results clearly showed that fish fed the synbiotic had significantly increased final body weight in comparison to control treatment ($P<0.05$). The synbiotic also had significant positive effects on specific growth rate (SGR) and daily growth rate (DGR) in comparison to the control treatment. Also synbiotic had positive effect on fish survival rate but it had not showed any significantly different among treatments. The best results in growth performance and survival rate were obtained by feeding 1 g/Kg synbiotic (T3) and somewhat in T2 (0.75 g/Kg).

Key words: Texas Cichlid · *Herichthys cyanoguttatus* · Synbiotic · *Biomin imbo* · Growth Performance and Survival Rate

INTRODUCTION

The Texas cichlid (*Herichthys cyanoguttatus*), also known as the Rio Grande Perch, and the Rio Grande Cichlid, is an iridescent golden color with pearl highlights and white dots on its body and fins. There are several black spots at the base of the caudal fin and along the middle, rear half of the body. The juveniles have an iridescent pearl-gray body with white dots on the body and fins. There is a black dot at the base of the caudal fin and one in the center of the body. It is also leaner in size. The Texas cichlid is one of the most popular aquarium species, as this species commands a higher price compared with most freshwater food species and other ornamental fish. In spite of the importance of Texas cichlid in ornamental fish culture, there has been neither research nor development of cost- effective feed for the intensive culture of this species. All ornamental fish feeds are 10-60 times higher in price than aquaculture feeds for food species. Second, the price of the feed targeted for a single ornamental species very dramatically compared to the price of food fish feeds, each of which is targeted for a specific species. For this reason, formulation feed rations for ornamental fish carry importance for aquarium sector [1].

Animal gut microflora consists of hundreds of different bacterial strains [2] able to promote digestion and absorption of nutrients, to increase body resistance to infectious diseases [3] to yield positive effects on growth and to improve general animal welfare [4]. Now FAO has designated the use of probiotics as a major means for the improvement of aquatic environmental quality [5]. Aquatic probiotics have been defined as live microbial supplements that can modulate microbial

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communities and improve microbial balance, thus providing benefits to the host [6]. Synbiotics refer to nutritional supplements combining probiotics and prebiotics in a form of synergism, hence synbiotics, enhancing their isolated beneficial effects. When two nutritional ingredients or supplements are given together the positive resulting effect generally follows one of three patterns: additively, synergism or potentiation. Additive effect occurs when the effect of two ingredients used together approximates to the sum of the individual ingredient effects. In case of synergism, it is said to occur when the combined effect of the two products is significantly greater than the sum of the effects of each agent administered alone. The term potentiation is used differently, some pharmacologists use potentiation interchangeably with synergism to describe a greater than additive effect and others use it to describe the effect that is only present when two compounds are concurrently [7, 8].

Synbiotics affects the host by improving the survival and implantation of live microbial dietary supplements in the gastrointestinal tract by selectively stimulating the growth and/or by activating the metabolism of one or a limited number of health promoting bacteria, and thus improving the host "welfare". In humans, probiotics are mainly active in the small intestine while prebiotics are only effective in the large intestine, so the combination of the two may give a synergistic effect [9]. The first application of synbiotics in fish is that of Rodriguez-Estrada *et al*. [10].

The present study examined the effects of synbiotic (*Biomin imbo*) on growth performance and survival rate in Texas cichlid (*Herichthys cyanoguttatus*) larvae via supplementation with Biomar.

MATERIALS AND METHODS

This experiment was conducted in a completely randomized design with four treatments (three synbiotic levels and a control) and three replicates per treatment for a total of twelve glass aquaria (each with a dimension of 30×40×60 cm). Larvae of Texas cichlid (initial weight: 0.5±0.11g) were obtained from the Institute of Ornamental Fish Hatchery in Gorgan, Iran. The density of fish larvae per aquarium were 10 fish. Texas cichlid larvae in control and experimental treatments were fed 5 percent of their body weight for 3 times a day (7.00, 15.00 and 23.00). In experiment, fishes were fed by commercial extruder diet (Biomar) with supplementation three levels of synbiotic (T2: 0.5 g/Kg, T3: 0.75 g/Kg and T4: 1 g/Kg). The control treatment was fed unsupplemented Biomar (T1). Water quality parameters of input water to rearing system were monitored each week throughout the experiment. The water temperature was 19.46±1.23°C, pH was 7.85±0.26 and water oxygen level was maintained above 7.65±0.55 mg L^{-1} during the experiment an electrical air pump (by a single filtration unit). The fish were weighed individually at the beginning and at the end of the experiment. Before distributing fish to the experimental aquaria (at the beginning of exogenous feeding), 25 fish were sampled from the holding aquaria for biometry. 7 larvae from each aquarium were sampled and the final weight and length of body were measured. Growth parameters of fish were calculated based on the data of biometry of Texas cichlid larvae.

Table 1: Nutrient composition of experimental diet (%)

Ingredients	%
Protein	54
Lipid	18
Fiber	1.5
Ash	10
Vitamin	2

Also the synbiotic (*Biomin imbo*) was prepared from the commercial product Protexin aquatic (Iran-Nikotak). Also Biomar was provided by aquatic foods company. Nutrient compositions of experimental diets (Biomar) are given in Table 1. Proximate composition of diets was carried out using the Association of Analytical Chemists (AOAC) methods. [11]. Protein was determined by measuring nitrogen (N×6.25) using the Kjeldahl method; Crude fat was determined using petroleum ether (40–60 Bp) extraction method with Soxhlet apparatus and ash by combustion at 550°C.

The data obtained from the trial were subjected to one-way analysis of variance (ANOVA) (using SPSS 18.0 programmer) to test the effects of dietary treatments. When ANOVA identified significant difference among groups, multiple comparison tests among means were performed using Duncan's new multiple range test. For each comparison, statistically significant differences were determined by setting the aggregate type I error at 5% ($P<0.05$).

RESULTS AND DISCUSSION

The one-way ANOVA showed a significant effect of synbiotic on growth performance ($P<0.05$) in Table 2. The maximum of final body weight (FBW) was observed in T3 (2.8±0.6 g) and had significantly different from other treatments ($P<0.05$) followed by T2 (2.1±0.9 g) and

Table 2: Growth parameters and survival rate of Texas cichlid (*Herichthys cyanoguttatus*) larvae in experimental treatments (trial 1-3) and control

Parameters	Control Unsupplemented Biomar	T1 supplemented Biomar with 0.5 g/kg	T2 supplemented Biomar with 0.75 g/kg	T3 supplemented Biomar with 1 g/kg
Initial weight (g)	0.5±0.11	0.5±0.11	0.5±0.11	0.5±0.11
Final body weight (g)	1.5±0.06^{d}	1.7±0.1^{c}	2.1±0.9^{b}	2.8±0.6^{a}
Body weight increased (g)	1±0.04^{d}	1.2±0.1^{c}	1.6±0.8^{b}	2.3±0.6^{a}
Specific growth rate for weight (% BW day^{-1})	1.22±0.2^{d}	1.48±0.9^{c}	1.79±0.5^{b}	2.06±0.1^{a}
Feed Conversion Ratio (%)	4.4±0.12^{a}	3.86±0.1^{b}	3.14±0.1^{c}	2.9±0.12^{d}
Feed Conversion efficiency (%)	0.23±0.01^{b}	0.26±0.01^{b}	0.32±0.03^{a}	0.35±0.02^{a}
Daily growth rate (g)	1.11±0.3^{d}	1.56±0.11^{c}	2.22±0.8^{b}	3.0±0.1^{a}
Survival rate (%)	92.12±3.71^{a}	92.28±2.28^{a}	94.18±4.18^{a}	98.09±3.18^{a}

Groups with different alphabetic superscripts at the same row differ significantly at P<0.05 (ANOVA)

T1 (1.7±0.1 g), than this two treatments had significantly different to each other (P<0.05) and other treatments. The lowest final body weight was observed in control group (1.5±0.06 g) than it had significantly different from other treatments (P<0.05). The specific growth rate (SGR) also showed similar trend to FBW, highest in the T3 (1 g/kg synbiotic) treatment (2.06±0.1) followed by 0.75 g/kg synbiotic (T2) treatment (1.79±0.5) and T1 group (1.48±0.9) also the lowest SGR was obtained in the control group (1.22±0.2) and had significantly different to other treatments (P<0.05) (Table 2). Similar finding were observed by Nekoubin *et al*. [7], using synbiotic on Zebrafish (*Danio rerio*), Gatesoupe [12], in using *Bacillus toyoi* on turbot (*Scophthalmus maximus* Linnaeus, 1758), where Swain *et al*. [13], in Indian carps that improved the growth factors and feeding performance and Ghosh *et al*. [14] on the Rohu fish.

The growth parameters were significantly affected by addition of synbiotics to the rearing aquaria (P<0.05). The synbiotic had positive effect on growth parameters in all of synbiotic treatments in comparison with control treatment. The maximum of feed conversion efficiency (FCE) was observed in treatment T3 (0.35±0.02) and T2 (0.32±0.03) that had no significantly different to each other (P>0.05). The lowest FCE was obtained in T1 (0.26±0.01) and control group (0.23±0.01). T1 and control group had not significantly different to each other in FCE value (P>0.05).

Effects of commercial probiotic on aquaculture has been investigated by several researchers, and some of these researches has not shown any positive effects on growth parameters or survival rate or any promising result on the cultural condition. For instance, Shariff *et al*. [15] found that treatment of *Penaeus monodon* with a commercial *Bacillus* probiotic did not significantly increase survival rate. These results disagree with our findings, although fish and crustaceans may respond differently to probiotics.

Bagheri *et al*. [16] found that supplementation of trout starter diet with the proper density of commercial bacillus probiotic could be beneficial for growth and survival of rainbow trout fries. This finding agrees with our results. Ghosh *et al*. [17] indicated that the *B. circulans*, *B. subtilis* and *Bacillus pamilus*, isolated from the gut of Rohu, have extracellular protease, amylase, and cellulose and play an important role in the nutrition of Rohu fingerlings. The photosynthetic bacteria and *Bacillus* sp. (isolated from the pond of common carp) was used in diet of common carp (*Cyprinus carpio* Linnaeus, 1758) by Yanbo & Zirong [18].

The best food conversion ratio was obtained in T3 (2.9±0.12) and the lowest was observed in control group (4.4±0.12). Nekoubin *et al.* [7] reported that using 1g/kg of synbiotic had better result in FCR value. This finding agrees with our results. Nekoubin *et al*. [7] also reported synbiotic had significantly effect in survival rate on zebrafish. But this finding disagrees with our results because synbiotic had not significantly different in survival rate however using 1g/kg synbiotic (T3) had better result in survival rate (98.09±3.18) but it had not significantly different to other treatments (P>0.05).

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REFERENCES

1. Sales, J. and G.P.J. Janssens, 2003. Methods to Determine Metabolizable Energy and Digestibility of Feed Ingredients in the Domestic Pigeon (Columba livia domestica) Poultry Science, 82: 1457-1461.

2. Walker, W.A. and L.C. Duffy, 1998. Diet and bacterial colonization: role of probiotics and prebiotics. J. Nutritional Biochemistry, 9: 668-675.
3. Tannock, G.W., 1988. The normal microflora: new concepts in health promotion. Microbiology Sci., 5(1): 4-8.
4. FAO/WHO, 2001. Report on Joint FAO/WHO Expert Consultation on Evaluation of Health and Nutritional Properties of Probiotics in Food Including Powder Milk with Live Lactic Acid Bacteria. 1–4 October 2001, Cordoba, Argentina. Available at: ftp://ftp.fao.org/ es/esn/food/probio_report_en.pdf (Accessed 23 August 2007).
5. Subasinghe R.P., D. Curry, S.E. McGladdery and D. Bartley, 2003. Recent technological innovations in aquaculture. Review of the State of World Aquaculture, FAO Fisheries Circular, pp: 59-74.
6. Gram L., J. Melchiorsen, B. Spanggaard, I. Huber and T.F. Nielsen, 1999. Inhibition of *Vibrio anguillarum* by *Pseudomonas fluorescens* AH2, a possible probiotic treatment of fish. Applied and Environmental Microbiol., 65: 969-973.
7. Nekoubin, H., E. Gharedaashi, M. Imanpour, H. Nowferesti and A. Asgharimoghadam, 2012. The influence of synbiotic (*Biomin imbo*) on growth factors and survival rate of Zebrafish (*Danio rerio*) larvae via supplementation with Biomar**.** Global Veterinaria 8 (5): 503-506, 2012 ISSN 1992-6197 IDOSI Publications.
8. Chou, T.C., D. Rideout, J. Chou and J.R. Bertino, 1991. Chemotherapeutic synergism, potentiation and antagonism. In: Dulbecco R (Ed), Encyclopedia of human biology, vol. 2. Academic Press, San Diego, California, pp: 371-379.
9. Gibson, G.R. and M.B. Roberfroid, 1995. Dietary modulation of the human colonic microbiota: introducing the concept of prebiotics. J. Nutr., 125: 1401-1412.
10. Rodriguez-Estrada, U., S. Satoh, Y. Haga, H. Fushimi and J. Sweetman, 2009. Effects of single and combined supplementation of *Enterococcus faecalis*, mannanoligosaccharide and polyhydrobutyric acid on growth performance and immune response of rainbow trout *Oncorhynchus mykiss*. Aquacult. Sci., 57: 609-617.
11. AOAC, 2000. Official methods of analysis. Association of official analytical chemist. EUA.
12. Gatesoupe F.J., 1991. *Bacillus* sp. Spores: A new tool against early bacterial infection in turbot larvae, *Scophthalmus maximus* ln: Larvens P., E. Jaspers and I. Roelands, (Eds), Larvi–fish and crustacean larviculture symposium. European Aquaculture Society, Gent., 24: 409-411.
13. Swain, S.K., P.V. Rangacharyulu, S. Sarkar and K.M. Das, 1996. Effect of a probiotic supplementation on growth, nutrient utilization and carcass composition in merigal fry. Aquaculture, 4: 29-35.
14. Ghosh, K., S.K. Sen and A.K. Ray, 2003. Supplementation of an isolated fish gut bacterium, *Bacillus circulans*, in Formulated diets for Rohu, *Labeo rohita*, Fingerlings. Aquaculture-Bamidgeh., 55(1): 13-21.
15. Shariff, M., F.M. Yusoff, T.N. Devaraja, S. Srinivasa and P. Rao, 2001. The effectiveness of a commercial microbial product in poorly prepared tiger shrimp, *Penaeus monodon* (Fabricius), ponds. Aquac. Res., 32: 181-187.
16. Bagheri, T., A. Hedayati, V. Yavari, M. Alizade and A. Farzanfar, 2008. Growth, survival and gut microbial load of rainbow trout (*Onchorhynchus mykiss*) fry given diet supplemented with probiotic during the two months of first feeding. Turkish Journal of Fisheries and Aquatic Science, 8: 43-48.
17. Ghosh, K., S.K. Sen and A.K. Ray, 2002. Characterization of Bacillus isolated from the gut of Rohu, *Labeo rohita*, fingerlings and its significance in digestion. Appl Aquaculture., 12: 33-42.
18. Yanbo, W. and X. Zirong, 2006. Effect of probiotic for common carp (*Cyprinus carpio*) based on growth performance and digestive enzymes activities. Animal Feed Science and Technology, 127: 283-292.