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Effect of Graded Levels of G-probiotic on Growth, Survival and Feed Conversion of Tilapia, *Oreochromis mossambicus*

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The effect of G-probiotic on growth, survival and feed conversion in *Oreochromis mossambicus* was studied. Three diets formulated by incorporating the growth promoter, G-probiotic at 5.0, 7.5 and 10.0 g/kg diet respectively were evaluated. The crude protein content was 30% in each diet. The diets were fed to triplicate groups of tilapia fry twice daily at a level of 10% of their biomass for 90 days. Water quality parameters recorded during the experimental period were within the range suitable for tilapia growth. The results showed better specific growth rate, food conversion rate and protein efficiency ratio in the group which was given 7.5 g G-probiotic/kg diet.

Key words: G-probiotic, *Oreochromis mossambicus*, growth, survival, feed conversion, protein efficiency ratio

Various growth promoters have been tried to boost aquaculture production. Steroid hormones have been found to be effective growth promoters but their use may result in residues of these compounds in the muscle and hence is not considered to be safe. In this context the use of non-hormonal growth promoters of natural and organic origin is gaining importance. Donaldson *et al.* (1979) reviewed the comparative endocrinology of the regulating hormones in fish, while Matty (1986) outlined the effect of hormones on food intake and nutritional state. Because of apprehension about the ill effects of residual steroids, emphasis is now shifting to the use of protein hormones. Among them, growth hormone, thyroid hormone and insulin have been shown to influence fish growth (Higgs *et al.*, 1979; Ablett *et al.* 1981; Schuttle *et al.*, 1989).

Probiotics stimulate digestion and also depress post-metabolic activities that lead to the production of methane and ammonia which are toxic to fish. G-probiotic is known to contain yeast and B-complex vitamins, as specified by the manufacturer and it also possibly supplies digestive enzymes and certain essential nutrients (Douillet & Langdon, 1994). In this study an attempt has been made on the comparative effectiveness of graded levels of G-probiotic as a feed additive on growth, survival and feed conversion of tilapia, (*Oreochromis mossambicus*).

Materials and Methods

A closed recirculatory system consisting of 12 circular fiber glass tanks of 120 l capacity, developed by Murthy (1997) was used for the experiment. Water was recirculated after passing through three-stage biological filter. Water flow of 1 l/min was maintained and the system was aerated regularly. Incandescent lighting was provided with 12 h light and 12 h dark regime.

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Three diets (T_1, T_2 and T_3) were formulated incorporating three levels (5.0, 7.5 and 10.0 g/kg diet respectively) of non-hormonal growth promoter, G-probiotic, keeping the crude protein level at 30%. Protein content was calculated for the ingredients other than G-probiotic, which was used over and above 100% of the ingredient composition. The dried, finely powdered ingredients were sieved and weighed. They were blended with water to get a dough. The dough so obtained was steam cooked for 30 min. The cooked dough was cooled and then mixed with weighed amounts of G-probiotic and vitamin-mineral premix. The mixed dough was then passed through a pelletiser to obtain 2.5 mm diameter pellets and dried until moisture content was reduced to less than 10%. The pellets were broken before feeding.

Farm bred and reared fry of tilapia, *O. mossambicus* were used for the growth study. Prior to start of experiment, they were acclimated to laboratory conditions for a week. During this period they were given standard pelleted diet developed by Varghese *et al.* (1976) at the rate of 10% of body weight. Tilapia fry were stocked at the rate of 10 per tank. Each test diet was fed to three replicate groups of fish. The frequency of feeding was twice daily at 6.00 h and 18.00 h and fish were fed *ad libitum* for a period of 90 days. Unconsumed feed was collected, weighed and feed intake was calculated. Faecal matter was siphoned out after 6 h of feeding.

Proximate analysis of feed ingredients and diets was performed according to AOAC (1995) methods. Nitrogen-free extract (NFE) was calculated by the difference method of Hastings (1976). The gross energy content of the basal diet was calculated using physiological fuel values of 20.96 kJ/g (5 Kcal/g) for protein (Smith, 1976) and 37.72 kJ/g (9 Kcal/g) and 16.76 kJ/g (4 Kcal/g) for fat and carbohydrate (NFE) respectively (Hastings, 1975).

Fish sampling was done once in 15 days to record the growth and to adjust the amount of feed to be given. Water quality parameters such as pH, temperature, dissolved oxygen, free carbon dioxide and total alkalinity were analyzed following standard methods (APHA, 1995) once in 15 days.

Individual weight of tilapia from each treatment was measured in the beginning as well as at the end of the experiment and weight gain was calculated. The average weight gain of the fish at the end of the experiment was tested using one way analysis of variance (Snedecor & Cochran, 1968) for the significant difference among the treatment groups.

Results and Discussion

The proximate composition of the feed is given in Table 1. Protein content and the calorific value were kept constant for all the three groups. Water quality parameters recorded during the experimental period were within the range suitable for fish culture (Table 2). The mean weight gain, survival, specific growth rate, feed conversion rate and protein efficiency ratio are presented in Table 3. Fish fed diet T_2 showed the highest weight gain followed

Table 1. Proximate composition (%) and calorific content of the experimental diets

	Diets		
	T_1	T_2	T_3
Dry matter	93.00±0.10	92.64±0.85	92.81±0.15
Crude protein	28.86±0.20	30.29 ±0.32	30.56±0.09
Crude fat	6.05±0.27	6.09±0.07	6.14±0.20
Crude fibre	4.34±0.26	4.42±0.43	5.00±0.14
Ash	7.12±0.18	7.28±0.31	7.30±0.31
NFE	45.73	44.56	43.81
Caloric content (kJ/g)	16.18	16.09	16.04

Table 2. Water quality parameters (range) recorded during the experimental period

	Diets		
	T_1	T_2	T_3
Temperature (°C)			
Atmosphere	26.00-28.00	26.00-28.00	26.00-28.00
Water	28.00-30.00	28.00-30.00	28.00-30.00
pH	7.07-8.13	7.13-8.77	7.10-7.78
Dissolved oxygen (mg/l)	7.83-10.83	6.90-11.01	7.75-10.04
Free carbon dioxide (mg/l)	0-0.10	0-0.13	0-0.37
Total alkalinity (mg/l)	50.53-54.57	47.57-54.70	43.70-48.88

Table 3. Growth, survival, SGR, FCR, PER and percentage weight gain of *O. mossambicus* fed graded levels of G-probiotic

	Diets		
	T_1	T_2	T_3
Initial weight (g)	1.04±0.03	1.07±0.05	1.06±0.04
Final weight (g)	3.98±0.12	4.14±0.62	3.78±0.36
Weight gain (%)	282.69	286.92	256.60
Survival (%)	93.30	93.30	90.00
SGR[1]	1.49±0.06	1.50±0.17	1.41±0.08
FCR[2]	3.44±0.51	3.42±0.36	3.67±0.14
PER[3]	0.97±0.16	0.97±0.11	0.89±0.03

[1]SGR ($\log_e$ Final weight-$\log_e$ Initial weight/Number of days)x100

[2]FCR Dry weight of feed given(g)/Gain in weight of fish (g)

[3]PER Increment in body weight (g)/Protein intake (g)

by T_1 and T_3. The highest percentage weight gain was achieved with T_2 diet and the lowest weight gain was recorded with T_3 diet. Specific growth rate also followed the same trend. Survival ranged from 90.00 to 93.3%. Higher survival rates were observed in the T_1 and T_2 groups. Feed conversion rate was better in T_2 (3.43) than in T_3 (3.67). Protein efficiency ratio was low in the fish which received the diet T_3 when compared with groups which received diets T_1 and T_2. Statistical significance was observed between T_2 and T_3, while there was no significant difference between T_1 and T_2 groups.

Other non-hormonal growth promoters such as Livol, Crown-gro-fast etc. are known to stimulate the growth of fish. The action of these growth promoters is dose dependent and species specific. Only few experimental studies have been conducted to test the possible growth promoting effect of herbal preparations on carps and tilapia. Livol induced highest growth at a dosage of 1% of the diet in common carp (Abraham, 1992; Shadakshari, 1993), at 0.5% level in catla (Gireesha, 1993) and rohu (Maheshappa, 1993). Crown-gro-fast induced maximum growth in mahseer at a level of 1.5% of the diet (Shivakumar, 1995). Singh (1993) used Aquagran, a non-hormonal growth promoter of natural origin in the diet of common carp and observed that this resulted in significantly better weight gain at higher dosage of 4.5% of the diet.

Stafac-20 which contains 2% viriginiamycin as an active ingredient was incorporated in a fish meal based diet with 35% protein and tested on catla, rohu and mahseer (Kumar, 1994). Stafac-20 at 60 ppm level induced higher weight gain in catla fry and mahseer fingerlings, while 100 ppm level gave maximum growth in rohu fry. Dietary G.pro, another feed additive resulted in significantly higher growth of common carp at a level of 2 g/kg diet. Bioboost forte (30%) when used in combination with fresh goat liver (50%) resulted in higher average weight and better survival of catla spawn (Mohanty *et al.*, 1996). G-probiotic a non-antibiotic feed additive, induced good growth in all the treatment groups in the present study and its growth promoting effects are comparable with the above feed additives. However, some more studies are needed to optimize the level of incorporation of G-probiotic in the commercial diets for tilapia.

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