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Comparison of Probiotic Diet and Commercial Diet on the Growth and Survival of Genetically Modified Zebrafish (*BrachydanioRerio*)

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Abstract:

Brachydaniorerio is a widely available species of zebrafish, which is a popular fish in aquarium. It is also an important species which are used for genetic research. The study was carried out to check the effects of probiotic diet and commercial diet on the growth and survival of *Brachydaniorerio*. The experiment was setup with one as a probiotic diet group and other with commercial diet group (Control group). The study was conducted in two aquariums each having 10 individuals of *Brachydaniorerio*. Each fish was measured for weight every 8 days and the weight was recorded. The study was conducted for 2 months; and the results showed that the group which was given Lactic acid bacteria culture and yeast (50 mg of lactic acid bacteria for 1st month and 50 mg of yeast for 2nd month) as well as 30 mg of commercial food. The weight gain (0.42gr), specific growth rate (1.03gr) and survival rate (50%) were recorded, whereas, the lowest weight gain (0.25gr), specific growth rate (1.39gr) and survival rate (30%) were measured for the group which was given a commercial diet (50 mg).

Keywords: *Brachydaniorerio*, probiotic, growth, survival rate

1. Introduction

Brachydaniorerio was developed as a genetically modified organism to detect the level of pollutants in the environment as it is very sensitive to the environmental changes. *Brachydaniorerio* which are easily available in the market, these are genetically engineered strains of zebrafish (*Daniorerio*) that helps in the wide use in the laboratory research. (1) Genetically modified zebra fish (*Brachydaniorerio*) which are able to glow in the aquarium, which were changed to create a fluorescent pigments red, green and yellow which is very famous and also used as a popular household pet in aquarium. (2)

The farmed fishes are more likely to develop stress conditions which may cause reduced production or even death of fish. Probiotics is the answer to such problems. Probiotic are the naturally occurring organisms which help in improving the gut health of the host. There are several modes in which the probiotics works namely competitive exclusion of pathogenic bacteria, production of inhibitory compounds and enhancement of immune response against pathogenic organisms.(3) Thus, the experiment was carried out to check the effects of probiotic diet and commercial diet on the growth and survival rate of *Brachydaniorerio*.

2. Materials and Methods

- Experimental conditions: The study started in the first week of January 2015. The study was carried out in the laboratory aquariums to study the effects probiotics diet and commercial diet on the growth and survival of *Brachydaniorerio*. The rearing conditions were done in 2 aquariums with continuous aeration using the electronic aerator and the temperature was maintained using the thermostat (Temperature=28⁰c). The water was changed up to 50 % daily to maintain the water quality.
- Feeding rate: The probiotic group was supplemented with the lactic acid bacteria (50mg) and commercial food (30 mg) twice a day; this was continued for 1st month. Then, in the 2nd month the probiotic group was supplemented with dry yeast cells (50mg) and commercial food (30) mg twice a day. While, the non-probiotic group was given only commercial food (50mg) twice a day which was continued for 2 months.
- Sample collection: Ten fish from each group were taken randomly to measure for weight gain, which was carried out for every 1 week in 2 months period.

2.1. Parameters for Growth Measurements

Weight Gain (WG) = Final body weight (g) – Initial body weight (g)

Weight Gain (WG) % = [Final body weight (g) – Initial body weight (g)] × 100

Specific growth rate (SGR) = [Ln (Final body weight (g)) – Ln (Initial body weight (g))] / t × 100

Survival rate = Final number of prawn / Initial number of prawn × 100

3. Results

After 2 months, the growth performance of *Brachydaniorerio* in terms of average weight gain which were measured for every 8 days is presented in table 1 and also the effects of probiotic feeding diet and commercial feeding diet on the survival number of fish are presented in table 2.

Days	8	16	24	32	40	48	56	60
Probiotic diet	0.48	0.53	0.58	0.64	0.69	0.85	0.91	0.98
Commercial diet	0.4	0.43	0.39	0.43	0.47	0.48	0.44	0.48

Table 1: Average weight (g) of fish during 60 day

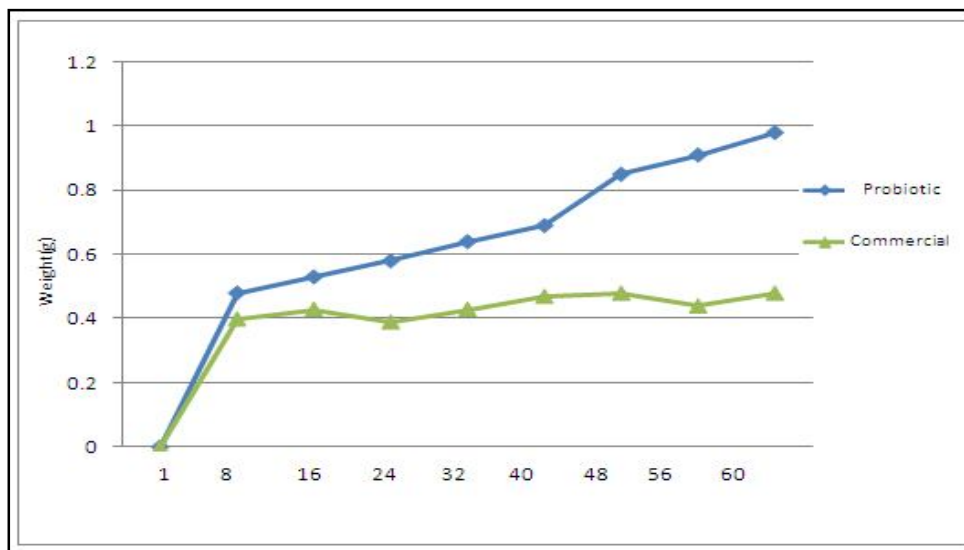


Figure 1: Body weight comparison between Probiotic and Commercial diet

This graph shows a comparison of the average weight gain between the probiotic diet group and commercial diet groups which was measured at the end of 8 days. According to this graph more weight gain can be seen in the probiotic diet group as compared to the commercial diet group.

Days	8	16	24	32	40	48	56	60
Probiotic diet	10	10	9	9	7	5	5	5
Commercial diet	10	10	7	7	7	5	4	3

Table 2: Survival number of fish in 60 days

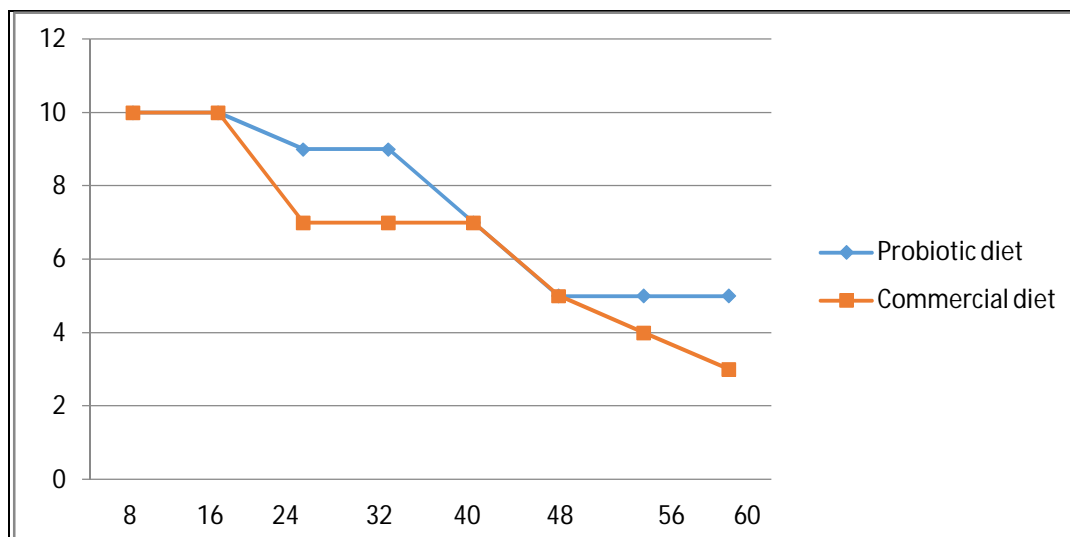


Figure 2: The survival number of fish during 60 days

This graph shows the survival number of fish during 60 days, the survival rate between the fish kept on changing, but at the end the probiotics supplemented diet group had more survival number (5) as compared to the commercial diet group (3).

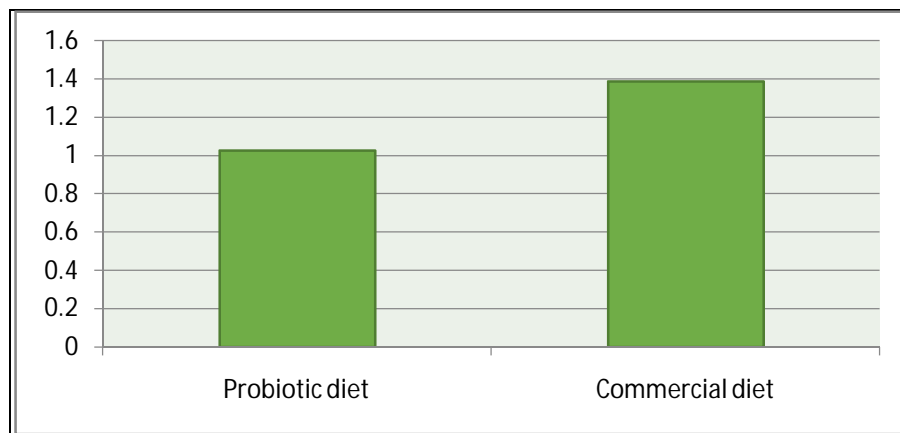


Figure 3: The Specific growth rate of fish during 60 days (SGR)

In this experiment, the group supplemented with probiotic diet showed more weight gain as compared to the group supplemented with commercial diet. Survival number in the probiotic diet group was higher than the commercial diet group i.e. Non-probiotic group. The specific growth rate (SGR) between the probiotic supplemented fish and commercial diet fish were different.

4. Discussion

In this experiment, better growth rate and survival ratio was examined in the probiotic supplemented diet group which must be a result of more probiotic cells in the diet and also which then increased in the intestine of the host. As good weight gain and survival conditions were seen in the *Brachydaniorerio*, it will be useful in improving the health as well as reduce the rate of mortality in this fish. The important ecological role of *Lactobacillus* spp. as a useful flora in the gastrointestinal tract, also improves the immune response, the secretion of antimicrobial substances, which helps in increasing the resistance of fish towards several pathogenic organisms and high rate of nutrients availability and carbohydrates, which are non-digestible (Fuller, 1989; Nikoskelainen et al., 2001; Dimitroglou et al., 2011). (5)

As compared to the bacterial cells, yeast is seen to utilize a large spectrum of simple and also more complex organic compounds. This results in the huge metabolic potential of yeast cells, which results in the production of several useful enzymes. The Polyamines, an important digestive enzyme which is secreted by yeasts are essential in the maturation of the digestive tract of larvae of fish. (6)

Based on the study, it is proved that the probiotic diet, which contains lactic acid bacteria and yeast cells is more effective and helps in increasing the body weight gain (0.42g) and survival rate (50 %). Whereas the commercial diet showed less body weight gain (0.25g) and survival rate(30%).

5. Conclusion

The probiotic diet group showed the maximum growth rate and survival rate. Thus, it is suitable for further use as it didn't show any negative effects on *Brachydaniorerio*. Whereas the commercial diet group showed less weight gain and survival rate.

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7. References

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