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Study of the effect of prebiotic (*Saccharomyces cerevisiae*) and acidifier on growth parameters in grower's rainbow trout (*Oncorhynchus mykiss*)

Javid Mortazavi Tabrizi[1], *Abolfazl Barzeghar[2], Saeed Farzampour[3], Hamid Mirzaii[4] and Saeid Safarmashaei[5]

[1]*Department of Aquatic Disease and Hygiene, Tabriz Branch, Islamic Azad University, Tabriz, Iran*
[2]*Drug Applied Research Center of Tabriz, Iran*
[3]*Department of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran*
[4]*Department of food hygiene, Tabriz Branch, Islamic Azad University, Tabriz, Iran*
[5]*Young Researchers Club, Tabriz Branch, Islamic Azad University, Tabriz, Iran*

ABSTRACT

A study was conducted to Comparative study of the effect of dietary Prebiotic (Saccharomyces cerevisiae) (0.2%), Acidifier (0.15%) and prebiotic with acidifier on growth parameters of rainbow trout grower's (150 ± 5 g) compared to fish fed an un-supplemented diet, in three replicate. The prebiotic and acidifier was mixed with a particular commercial diets. The fish were evaluated at days 10, 20, 30 and 40 of being fed by the experimental diets in order to obtain, growth rate, total length, feed conversion rate, feed intake rate and survival rate. The result indicated that, significant differences in feed intake were found between different groups (P <0.05) and the prebiotic group had the highest feed intake. During this study, Fish fed prebiotic and prebiotic with acidifier displayed significantly increased (P <0.05) special growth rate compared to the control and acidifier fed fish. Fish fed prebiotic displayed significantly decreased (P<0.05) feed conversion rate compared to the control and acidifier fed fish. Fish fed acidifier displayed significantly decreased (P <0.05) total length compared to other groups. During testing, no casualties among the treatment groups and control fish were observed. The survey results showed that the rate of 2 kg ton^{-1} of prebiotic can improve fish growth parameters in comparison with other groups.

Keywords: Prebiotic, acidifier, growth parameters, rainbow trout.

INTRODUCTION

A prebiotic is defined as a nondigestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon and thus improves host health (Gibson and Roberfroid, 1995). The stimulated bacteria should be of a beneficial nature, namely bifidobacteria and lactobacilli (Gibson et al. 1999). To have these effects, Prebiotics must be able to withstand digestive processes before they reach the colon and preferably persist throughout the large intestine such that benefits are apparent distally (Gibson et al. 2004). Some advantages of probiotics include: (a) resist gastric acidity, hydrolysis by enzymes and GI Absorption. (b) Be fermented by the intestinal microbiota. (c) Stimulate selectively the growth and/or activity of intestinal bacteria associated with health and well-being (Merrifield, et al. 2010). Prebiotics have demonstrated some benefits in fish (Burr et al., 2005; Gatlin et al., 2006; Ringø and Olsen, 2008; Ringø et al., 2010)

but the use of prebiotics in salmonid studies remains relatively limited. Based on the prebiotic results available in reviews, on the effects of adding prebiotics in fish diets, more research efforts are needed in order to provide the aquaculture industry, the scientific community, the regulatory bodies and the general public with the necessary information and tools. (Merrifield, et al. 2010).

Acidifiers consisting of organic acids and their salts present a promising alternative. In animal nutrition, acidifiers exert their effects on performance via three different ways: (a) in the feed; (b) in the gastro-intestinal tract of the animal; and (c) due to effects on the Animal's metabolism (Freitag, 2007). Acidifiers function as conserving agents by reducing the pH of the feed, and thereby inhibiting microbial growth and thus lower the uptake of possibly pathogenic organisms and their toxic metabolites by the farmed animals. The mode of action of organic acids in the intestinal tract involves two different ways: on one hand they reduce the pH-level in the stomach and particularly in the small intestine, and on the other hand inhibit growth of gram negative bacteria through the dissociation of the acids and production of anions in the bacterial cells. Most organic acids have a considerable amount of energy (Lückstädt, 2008). The aim of the present study was to investigate the study of the effect of dietary Prebiotic (*Saccharomyces cerevisiae*) and acidifier on growth parameters in grower's rainbow trout.

MATERIALS AND METHODS

Rainbow trout (*Oncorhynchus mykiss*) were obtained from a commercial fish farm. The fish were fed with a standard commercial feed (Faradaneh, Iran) (table. 1). The fish had not been vaccinated no exposed to fish diseases and were deemed specific pathogen free. The fish were acclimated for 1 week in tanks before the start of the trial. After the acclimation period the average weight and total length of the fish was 150 ± 5 g and 25.5±0.5 cm, respectively. The fish were divided into 2500 L tanks during the trial, water temperature, oxygen concentration and pH value were kept at 12.5±1^{o}c, 7.5±0.25 mg L^{-1}, 7.2±0.5, respectively. During this study a control group and three treatment groups each received 100 pieces of rainbow trout, in total 1200 were tested. In first treatment group amounts of 2 kg/ton prebiotic (*Saccharomyces cerevisiae*) (A-max, USA) (Asadi, 2008) , In Second treatment amount of 1.5 lit/ton Acidifier (Acesol Plus, Italy) (de Wet, 2005)(table. 2) and In third treatment amounts of 2 kg/ton^{-1} prebiotic (*Saccharomyces cerevisiae*) with 1.5 lit/ton Acidifier, were used. All groups were fed on their respective diets four times daily (08.00, 12.00, 16.00 and 20.00) for a period of 7 weeks. The feeding rate was initially 1.2% of body weight per day and gradually decreased to 1.1%. During this study, the values of prebiotic and Acidifier in sunflower oil (30 ml per kg food) mixed and Pellets were sprayed on a uniform. Be noted that for uniformity of the test, sunflower oil was added to the control group. The fish were evaluated at days 10, 20, 30 and 40 of being fed by the experimental diets in order to obtain special growth rate (SGR), total length, feed conversion rate (FCR), feed intake rate and survival rate.

The growth performances of growers were calculated based on standard formulae: SGR= (In final weight-In initial weight) ×100/days, FCR= feed consumption/body weight gain and survival rate= (final number of fish/initial number of fish) ×100 (Luo et al., 2010, Hagghighi et al. 2009).

Table 1. Proximate composition of commercial feed (Dry matter basis)

Ingredients(%)	GFT2
Crude Protein	36
Crude lipid	14
Ash	10
Fiber	4
Phosphorus	1
Moisture	11
Gross energy (kcal kg^{-1})	4462

Table 2. Profile acidifier used brand Acesol plus

material	Amount per liter
Acetic Acid	400000 mg
Lactic acid	90000 mg
Citric acid	10000 mg

RESULTS

The effect of prebiotic (*Saccharomyces cerevisiae*) and acidifier on growth parameters in grower's rainbow trout is displayed in Table 3. The result indicated that, significant differences in feed intake were found between different groups (P <0.05) and the prebiotic group had the highest feed intake. During this study, Fish fed prebiotic and prebiotic with acidifier displayed significantly increased (P <0.05) special growth rate compared to the control and acidifier fed fish. Fish fed prebiotic displayed significantly decreased (P<0.05) feed conversion rate compared to the control and acidifier fed fish. Fish fed acidifier displayed significantly decreased (P <0.05) total length compared to other groups. During testing, no casualties among the treatment groups and control fish were observed.

Table 3. The effects of peribiotic (*Saccharomyces cerevisiae*) and acidifier on growth parameters in grower's rainbow trout

Factor / Group	Total length	SGR	FCR	feed intake
control	28.22±0.01^{a}	95±2.89^{a}	1.17±0.01^{a}	113.65±0.02^{a}
Prebiotic	28.26±0.02^{a}	104±0.57^{b}	1.12±0.005^{b}	114.55±0.02^{b}
Acidifier	28.12±0.01^{a}	105.33±1.45^{b}	1.15±0.01^{ab}	120.5±0.28^{c}
Prebiotic + Acidifier	27.6±0.2^{b}	84.67±1.45^{c}	1.37±0.01^{c}	117.35±0.02^{d}

DISCUSSION

Prebiotics mainly consist of oligosaccharides promoting beneficial bacterial growth within the GI tract (Gibson et al., 2003). Gibson et al. (2004) suggested that a prebiotic has to resist gastric acidity, hydrolysis by (mammalian) enzymes and GI absorption, be fermented by the intestinal micro biota and stimulate selectively the growth and/or activity of intestinal bacteria associated with health and well-being. (Gibson et al. 2004).

Acidifiers can mitigate the impact of bacterial infections, thereby preventing diseases and thus affording higher survival rates. The use of acidifiers can be an efficient tool to achieve sustainable, economical and safe fish and shrimp production (Lückstädt, 2008).

During periods of high feed intake, such as when the animals are young or when the feeds are high in protein, hydrochloric acid concentrations in the stomach are reduced. This reduction negatively impacts pepsin activation and pancreatic enzyme secretion and impairs digestion. Providing acidifiers in the feed addresses this problem and aids feed digestion (Eidelsburger, 1997). Positive effects of organic acids on protein hydrolysis have been demonstrated (Mroz et al. 2000). Similarly, feed supplementation with organic acids has been shown to lead to lower duodenal pH, improved nitrogen retention and increased nutrient digestibility (Øverland et al. 2000).

During this study, significant differences in feed intake were found between different groups (P <0.05) and the prebiotic group had the highest feed intake.

Fish fed prebiotic and prebiotic with acidifier displayed significantly increased (P <0.05) total weight gain compared to the control and acidifier fed fish. Fish fed prebiotic displayed significantly decreased (P<0.05) feed conversion rate compared to the control and acidifier fed fish. Fish fed acidifier displayed significantly decreased (P <0.05) total length compared to other groups. During testing, no casualties among the treatment groups and control fish were observed.

More information about the effects of prebiotics on growth performance is available for MOS. In trials with rainbow trout reared either in fresh water net Cages or fresh water raceways, Staykov *et al*. (2007) found that 0.2% dietary MOS supplementation increased final body weight and reduced feed conversion ratio and mortalities in both net cage– and raceway–reared trout (Staykov *et al*. 2007).

In using prebiotic such as mannanoligosaccharide, fructooligosaccharide and galactooligosaccharide, the use of Atlantic salmon fish meal-based diet supplemented with 10 g kg-1 of these prebiotics did not showed effects on growth and digestibility (Grisdale Helland et al., 2008). In using commercial prebiotic Grobiotic®-AE, feed efficiency was significantly improved when using a 7- week diet was supplemented with 10 - 20 g kg-1 of this commercial food on hybrid striped bass, but the growth was not significant (Li and Gatlin, 2004). Salamatdoust

nobar *et al* (2011) reported that FCR and SGR significantly affected in fingerling rainbow trout fed prebiotic (*Saccharomyces cerevisiae*) (Salamtdoust et al 2011). As a result, despite the works of different farmers and researcher, the intake of prebiotic is primarily dependent on the types of ingredients used in diet formulation and will therefore vary widely among species and diets (Yousefian and Sheikholeslami Amiri , 2009)

The use of organic acids however was not only tested in Salmoniformes, but also in tropical warm-water species, like tilapia or catfish. Ramli *et al.* (2005) tested the use of potassium-diformate as a non-antibiotic growth promoter in tilapia grow-out in Indonesia. Furthermore, fish were challenged orally starting day 10 of the culture period with *Vibrio anguillarum*. The 2 kg ton^{-1} inclusion of the potassium salt of the formic acid lead to an improvement in weight gain and feed conversion ratio in tilapia by 18.6% and 8.2% respectively and indicate furthermore that the chosen acidifier is able to counteract bacterial infections in tilapia.(Ramli *et al*. 2005). The effect of supplementing commercial diets with sodium salts of lactic and propionic acids were tested in Arctic charr in brackish water at 8^{0C} .Fish fed a diet with 1% sodium lactate added to it increased in weight from about 310 to about 630 g in 84 days, while fish fed diets without either salt reached a final weight of only 520 g ($P < 0.05$). Inclusion of 1% sodium propionate in the diet however had a growth-depressing effect compared to the control ($P < 0.05$) (Ringø, 1991).

As regards, beneficial effects of prebiotic and acidifier, the present study indicates that the rate of 2 kg ton^{-1} of prebiotic can improve fish growth parameters in grower's rainbow trout and Use of acidifier alone in dosage 1.5 lit ton^{-1} Can have negative results in this parameters.

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REFERENCES

[1] Asadi, M., **2008**. Effects of different levels of probiotic on performance parameters, survival rate and carcass quality in grower's rainbow trout. M.Sc. Thesis, Shabestar Branch, Islamic Azad university. Iran.73.
[2] Burr, G., D. Gatlin III and S. Ricke, **2005**. *Journal World Aquaculture Society*, 36: 425–436.
[3] de Wet, L., **2005**. Organic acids as performance enhancers. Aqua Feeds. Formulation & Beynod, 2: 12-14.
[4] Eidelsburger, U., **1997**. Optimierung der Futterqualita¨ t ist nurein Teilaspekt. Schweinewelt, 18–21.
[5] Freitag, M., **2007**. Organic acids and salts promote performance and health in animal husbandry. In: Luckstadt, editor. Acidifiers in Animal Nutrition – A Guide for Feed Preservation and Acidification to Promote Animal Performance. 1st ed. Nottingham University Press, Nottingham, UK. 1–11.
[6] Gatlin III, D.M., Li. P. Wang, X. Burr, G.S. Castille and A.L. Lawrence, **2006**. Potential applications of prebiotics in aquaculture. In: Elizabeth Cruz Suárez, L., Marie, Denis Ricque, Salazar, MireyaTapia, López,MarthaG., Villarreal,DavidA., Ana, C. (Eds.), PuelloCruzyArmando Garcia Ortega. Avances en Nutrición Acuícola VIII. VIII Simposium Internacional de Nutrición Acuícola. 15–17 Noviembre. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, Méico. ISBN 970-694-333-5.
[7] Gibson, G.R., RA. Rastall and M.B. Roberfroid, **1999**. Probiotics. In:Colonic Microbiota:Nutrition and Health. G. R. Gibson and M. B. Roberfroid (Eds). Kluwer Academic Press, Dordrecht, pp: 10-39.
[8] Gibson, G.R., and M.B. Roberfroid, **1995**. *Journal of Nutrition*, 125: 1401-1412.
[9] Gibson G.R., H.M. Probert, J.V. Loo, R.A. Rastall and M.B. Roberfroid, **2004**. *Nutrition Research Reviews*, 17: 259–275.
[10] GIBSON, G. R., A. RASTALL R and R. FULLER, **2003**. The health benefi ts of probiotics and prebiotics. In: Fuller R., Perdigon G. (Eds.), *Gut Flora, Nutrition, Immunity and Health*. Blackwell Publishing Ltd, Oxford, UK, pp: 52–76.
[11] GRISDALE HELLAND, B., S. J. HELLAND and D. M. GATLIN III, **2008**. *Aquaculture*, 283: 163–167.
[12] Haghighi, D. T., C. R. Saad, H. Hosainzadeh Sahafi and D. Mansouri, **2009**. *Iranian Journal of Fisheries Sciences*, 8(1): 13-24.
[13] LI, P., and D. M. GATLIN III, **2004**. *Aquaculture*, 231: 445– 456.
[14] Lückstädt, Ch., **2008**. *Nutrition and Natural Resources*, 3(44).
[15] Luo, G., J. Xu, Y. Teng, C. Ding and B.Yan, **2010**. *Aquaculture Research*, 41: 210-219.
[16] Merrifield, D.L., A. Dimitroglou , A. Foey, S.J. Davies, R.T.M. Baker, J. Bøgwald, M .Castex and R. Ringø, **2010**. *Aquaculture*, 302: 1–18.

[17] Mroz, Z., W. Krasucki, E. Grela, J. Matras and U. Eidelsburger, **2000**. *Proceedings of the Society of Nutrition Physiology*, 9: 72.
[18] Øverland, M., T. Granli, N.P. Kjos, O. Fjetland, S.H. Steien and M.Stockstad, **2000**. *Journal of Animal Science*, 78: 1875–84.
[19] Ramli, N., U. Heindl and S. Sunanto, **2005**. Effect of potassium-diformate on growth performance of tilapia challenged with *Vibrio anguillarum*. Abstract CD-Rom, WAS Conference, May 9-13, 2005, Bali, Indonesia.
[20] Ringø, E., **1991**. *Aquaculture*, 96: 321–33.
[21] Ringø, E., and R.E. Olsen, **2008**. Gut health in aquatic species. World Nutrition Forum. The Future of Animal Production. Binder, E.M. and Schatzmayr, G. (Eds.). Nottingham University Press, Nottingham, UK, pp: 79–105.
[22] Ringø, E., R.E. Olsen, T.G. Gifstad, R.A. Dalmo, H. Amlund, G.I. Hemre and A.M. Bakke, **2010**. *Aquaculture Nutrition*, 16: 117-136.
[23] Salamatdoustnobar, R., A. Ghorbani, S.S. Ghaem magami and V. Motalebi, **2011**. *World Journal of Fish and Marine Scince*, 3(4): 305-307.
[24] Staykov, Y., P. Sring, S. Denev and J. Sweetman, **2007**. *Aquaculture International* 15: 153–161.
[25] Yousefian, M., and M. Sheikholeslami Amiri, **2009**. *African Journal of Biotechnology*, 8 (25): 7313-7318.