

PROBIOTICS: AN EFFECTIVE FEED SUPPLEMENT IN SHRIMP CULTURE

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ABSTRACT

The application of antibiotics are of no use, because of its ineffectiveness in many cases, or result in increases in virulence of pathogens and, furthermore, are cause for concern in promoting transfer of antibiotic resistance to human pathogens. As a remedial measure, application of gut/intestinal probiotics as a supplement along with feed has been suggested for shrimp culture as an effective farming practice for better growth, FCR (Feed conversion ratio) and disease control. The effect of gut probiotics mixed in a feed was studied for its effect on black tiger shrimp *Penaeus monodon* in the Aquaculture Department Laboratory of College of Marine Science and Technology, Massawa, Eritrea- (Northeast Africa) and was found to be effective in providing higher growth, better FCR and resistant to pathogenic infections.

Key words: Probiotics, Shrimp culture, Effective feed, Supplement

INTRODUCTION

Modern technologies and other sciences such as biotechnology and microbiology are important tools that could lead to a higher quality and greater quantity of products in aquaculture. Due to certain adverse effect of antibiotics, its usage in aquaculture is discouraged. Probiotics are now being used as an alternative to antibiotic treatment in aquaculture as remedial measures to control disease. As such the use of probiotics for sustainable and eco-friendly aquaculture is now gaining importance. Use of various additives to a balanced feed formula to achieve better growth is a common practice of many fish and shrimp feed manufacturers and farmers.

Probiotics are scientifically blended concentration of selected, adopted and cultured bacterial formulations plus enzymes and special buffers fermented with cereal and special substrate for use in aquaculture (Ravichandaran and Jalaluddin 1999). Probiotics, are defined by Fuller 1999 as 'a live microbial feed supplement' which beneficially affects the host animal by improving its intestinal microbial balance.

The use of probiotics as farm animal feed supplements dates back to the 1970s. They were originally incorporated in to feed to increase the animal's growth and improve its

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health by increasing its resistance to disease (Ali 2000). The beneficial effect of the application of certain beneficial bacteria in human, pig, cattle and poultry nutrition has been well documented. However, the use of such probiotics in aquaculture is a relatively new concept. The increasing interest in use of friendly bacterial candidates have instigated several research projects on their use to promote survival and growth of fish, crustaceans and oysters (Ali 2000).

The principal mode of action of probiotic bacteria is through competitive exclusion mechanisms in which pathogens are replaced or excluded through the development of a beneficial microbial population on the intestinal surface which leads to a reduction in disease, better health and thus better growth of the host.

Thus instead of using antibiotic, the application of gut/intestinal probiotic bacteria in shrimp farming can be an alternative measure for control of disease and better growth.

MATERIALS AND METHODS

The experimental work was carried out for 60 days during the period of March - April, 2013 in the Laboratory of Aquaculture Department at the College of Marine Science and Technology Massawa, located at 15°32'NL and 39°27'EL. Juveniles of shrimp (*P. monodon*) were collected from Hirgigo Bay of Red Sea around Massawa coast for the study purpose. These juveniles were allowed to acclimatize for a day at the study site prior to commencement of experimental work. Six fiber glass tanks of 300 litre were filled with sea water having salinity of 30 ppt, and stocked with a density of 10 juveniles in each tank with an average body weight of juvenile shrimp of about 4.2 grams each. Three tanks, namely T1, T2, and T3 were treated with commercial feed probiotic (intestinal probiotic), namely aqualact which was supplied by Biostadt India Ltd. Mumbai (India) and other tanks C1, C2 and C3 were taken as control. Both treated and control tanks were provided with artificial feed.

The probiotic aqualact was used at the rate of 5 gm/kg of feed which was mixed with the feed with the help of a nutritive binder, the cod liver. As claimed by the company aqualact contains *Lactobacillus sporogenes*, *Lactobacillus acidophilus*, *Bacillus licheniformis*, *Bacillus subtilis*, *Saccharomyces cerevisiae*, sea weed extracts, enzyme complex (Amylase, phytase, protease, cellulase, beta-galactosidase) (www.biostadt.com/aqua)

RESULTS AND DISCUSSIONS

On the completion of the experimental period of 60 days, the average gain in weight, final weight, initial weight and FCR were calculated for both treated and control tanks.

Within the experimental period, an increase in body weight in both treated and control tanks was observed but the tanks treated with probiotic supplemented diet had shown much higher growth, better FCR, moulting, animal activity and health condition over the control ones. In untreated tanks even few shrimps were noticed with having slight bacterial infections and protozoan infestations which was confirmed by microbiological examination, whereas in treated tanks there was no sign of any pathogenic infections.

Table. 1. Experimental data of shrimps (*P. monodon*) obtained in treated and control tanks.

Parameters calculated	Probiotic treated tanks	Control tanks
Initial weight	126.6 gm \pm 1.1	127 gm \pm 1
Final weight	360.7 gm \pm 3.4	309 gm \pm 2.3
Weight gained	234.1 gm \pm 2.6	182 gm \pm 1.3
Average initial weight	4.22 gm \pm 0.11	4.23 gm \pm 0.03
Average final weight	12.02 gm \pm 0.35	10.3 gm \pm 0.05
Average weight gain	7.8 gm \pm 0.09	6.07 gm \pm 0.02
FCR	1.54 \pm 0.04	2.0 \pm 0.03
Survival rate	100%	100%

Ali (2006) stated that probiotics, as bio-friendly agents such as lactic acid bacteria and *Bacillus* species, can be introduced in to the culture environment or incorporated with feed, can be used to control and compete with pathogenic bacteria as well as to promote the growth of the cultured organism. In the present experimental study similar result like growth promotion and no sign of any disease had been seen in the shrimps supplemented with gut probiotics.

Some of the previous studies made by Nogami and Maeda (1992) and Rengpipat *et al.* (1998) showed that supplementation of feed with gut probiotic helps in better growth and survival. Lara-Flores *et al.* (2003) explained that probiotic bacteria are good candidates for increasing the digestion of nutrients and growth in aquatic organisms whereas Irianto and Austin, (2002) said that nutrients in organisms could be improved by the detoxification of potentially harmful compounds in the diet by hydrolytic enzymes, including amylases and proteases, and the production of vitamins such as biotin and vitamin B12. The result of present study revealed that increase in weight of treated shrimps was 1.73 gms higher for each shrimp over the untreated. This increase can be regarded as substantial when culture is done at a farm level.

Probiotics are very innovative and a promising mechanism to control shrimp disease. Sugan (2009) mentioned that probiotics prevent infections by competitive exclusion, antimicrobial action and by some other means. Moriarity (1999) in his studies showed that probiotic bacteria enhances growth and helps in controlling diseases. Ravichandran and Jalaludin (1999) has also similar findings in his studies that bacterial amendments are effective in growth and disease control in shrimp culture. Similar findings of better

growth and no incidence of disease has been seen the present experimental work for the shrimps treated with probiotic supplementation.

CONCLUSION

The results have indicated that implementation of bacterial amendment technology i.e., the usage of intestinal probiotic along with the feed can be an effective means of biotechnological and eco-technological approach for better shrimp growth and disease control.

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