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BENEFICIAL EFFECT OF PROBIOTICS IN AQUACULTURE SYSTEMS- A REVIEW

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ABSTRACT

Aquaculture is one of the fastest rising sectors in the world today. An Aquaculture system is diversified as fresh, brackish and marine water culture systems. The growth of aquaculture as an industry has accelerated over the past decades, this has resulted in environmental damages and low productivity of various crops. The need for increased disease resistance, growth of aquatic organisms, and feed efficiency has brought about the use of probiotics in aquaculture practices. The first application of probiotics occurred in 1986, to less their ability to increase growth of hydrobionts (organisms that live in water). Probiotics were used to improve water quality and control of bacterial infections. Now a day there is documented evidence that probiotics can improve the digestibility of nutrients, increase tolerance to stress, and encourage reproduction. Currently, there are commercial probiotic products prepared from various bacterial species such as Bacillus sp., Lactobacillus sp., Enterococcus sp., Carnobacterium sp., and the yeast Saccharomyces cerevisiae among others, and their use is regulated by careful management recommendations. The present paper shows the current knowledge of the use of probiotics in aquaculture, its antecedents, and safety measures to be carried out and discusses the prospects for the study in this field.

KEYWORDS: Aquaculture, Probiotics, water quality, Disease Control, Growth promoters, reproduction, Tolerance - Stress, bacterial infections.

1. INTRODUCTION

Aquaculture is now fastest growing food producing sector in the world, is moving new directions intensifying and diversifying (Bondad-Reantaso et al., 2005). Aquaculture globally has undergone tremendous growth during the last 50 years from a production of less than a million tons in the early 1950 s to fast fifty million tons in the year 2008(FAO 2009). The global demand, aquaculture production practices have been intensified to a greater extent both in technological and practical measures (Tuan et al., 2013).The growth of Aquaculture industry is hampered by unpredictable mortalities which are caused by microorganisms. Aquaculture has a long history, originating tleast in the year 475 B.C. in China (C.E.Boyd and C.S. Tucker 1998), but they became important in the late nineteen-forties, since the method of aquaculture could be used to restock the water as a complement to natural spawning. Now days, aquaculture is a lucrative industry (M.Timmons, 2002, D.Cressey, 2009). The intensification of aquaculture practices requires cultivation at high densities, which has caused significant damage to the environment due to discharges of concentrated organic wastes, that deplete dissolved oxygen in ponds giving rise to toxic metabolites (H2O2,methane, ammonia, and nitrites), that often are responsible for mortality. Additionally, aquaculture has appropriated of water bodies used for recreational purpose, and sometimes make a water's waste because this natural resource is not reused in extensive aquaculture systems (P.G. Amaya and D.F. Castellano, 2006), Y.B. Wang and Z.R. xu, 2004). Moreeverunder this conditions of intensive production, aquatic species are subjected to high- stress conditions, increasing incidence of diseases and causing a decrease in productivity (M.G. Bondad, R.P. Subasinghe, J.R. Arthur et al., 2005). Out breaks of viral, bacterial, and fungal infections have caused devastating economic losses worldwide. India reported 210 million losses from 1995 to 1996. Added to this, significant stock mortality has been reported due to poor environmental conditions on farms, unbalanced nutrition, generation of toxins, and genetic factors (N.Kautsky, 2000).Hence necessitating of chemicalsand antibiotics in health management strategies (Newai-Fyzul and Austin 2014). Disadvantages promoted the Aquaculture industry to explore and develop strategies that are as equally effective as antibiotics Eco-and consumer friendly and most important sustainable (standen et al., 2013: Lazado et al., 2015). Vaccines are being developed and marketed, but which cannot be used as a universal disease control measure in aquaculture. The last decades, antibiotics used as traditional for fish disease management but also for the improvement of growth and efficiency of feed conversion. The development and spread of antimicrobial resistant pathogens were well documented (Kim et al., 2004, Cabello, 2006;Sarum,2006). The term of probiotics, meaning 'for life', is derived from the Greek words' Pro' and' Bio'. It was first used by Lilly and Stillwell in 1965. Substances secreted by one microorganism which stimulate the growth of other (Lilly and Stillwell1965). Probiotic is relatively new term which is used to name micro organisms that are associated with the beneficial effects of the host. Kozasa made the first empirical applications of probiotics in aquaculture. (M.Kozasa1986). Probiotic is a relatively new term which is used to name micro organisms that are associated with the beneficial effect for the host. Kozasa made the first empirical application of probiotics in aquaculture (M.Kozasa, 1986), considering the benefits exerted by the use of probiotics on human and poultry. He used spores of Bacillus toy as feed additive to increase the growth rate of yellow tail, seriola quinqueradiata. In 1991, porubcan (R.S.Porubcan, 1991), documented the use of Bacillus sp, to test its ability to increase productivity of Penaeus monodon farming and to improve water quality by decreasing the concentrations of ammonia and nitrite. In order to avoid or reduce the use of certain antimicrobials, biological control was tested, described as the use of natural enemies to reduce the damage caused by harmful organisms. Strictly speaking, a probiotic should not be classified as a biological control agent because it is not necessarily a natural enemy of the pathogen (G.B. Gomez, A.Roque, and J.F. Turnbull, 2000). Probiotics have the ability to inhibit the growth of pathogenic bacteria. Moriarty determined the ability of bacillus spp. to decrease the proportion of vibrio spp. in shrimp ponds, especially in sediments (D.J.W Moriarty, 1998). The concept of Aquatic probiotic is a relatively new one, and methods for evaluating the efficacy of probiotics are needed. Fuller (1989) proposed that a good probiotic has the following characteristics:

1. Effectiveness in application.
2. Non pathogenic and Non-toxic.
3. Surviving and being actively involved in the metabolism of gut environment.

Probiotic effects in aquaculture are not only limited to the intestinal tract, but also can improve the health of the host by controlling pathogens and improving water quality (Verschuere et al.2000; Zheng et al. 2012). The use of growth promoters allows improving performance of animals. Variety of substances with antibiotic function was used to improve performance of poultry pigs and cattle, especially penicillin and Tetracycline. Theuse of antibiotics additives to feed showed great benefits to animal husbandry. Improved weight gain and feed conversion. Probiotics have also received special attention from researchers seeking animal nutrition alternatives to the use of traditional growth promoters in the field of animal nutrition. This review summarizes beneficial effects of probiotics in Aquaculture.

2) Origin and Definition of Probiotic

The concept of probiotics was introduced in the early 20th century but the term was not coined until the 1960's (sanders, 2003). The term, probiotic, simply means 'for life,' originating from the Greek words' Pro' and 'Bios' (Gismondo et al., 1999). The most widely quoted definition was made by fuller (1989). He defined a probiotic is 'a live microbial feed supplement which beneficial affects the host animal by improving its intestinal balance '(Fuller 1989). The word Probiotic was introduced by Parker in 1974. Later it used to describe animal feed supplements which had beneficial effects on the host animal by influencing its gut flora (Parker, 1974). According to parker's definition Probiotics are "Organisms and substances which contribute to intestinal microbial balance". Tanoak (1997) defined probiotics as "living microbial cells administered as dietary supplements with the aim of improving health". The latest definition of probiotic is given as a viable mono or mixed culture of micro organisms which, when applied to animals or man, beneficially affects the host by improving the properties of indigenous flora (Havenarrand Huis Isn't Veld, 1992). A microbial dietary adjuvant that beneficially affects the host physiology by modulating mucosal and systemic immunity, as well as improving nutritional and microbial balance in the intestinal tract. (Naidu et al., 1999). Today probiotics are quite common place in health promoting "functional foods". For human's as well as therapeutic prophylactic and growth supplements in animal production and human health (Mon belli and Gismondo, 2000; Ouwehand et al., 2002; Sullivan and Nord, 2002; Senok et al.,2005). Multiple ways exist in which probiotic could be beneficial and these could act either singly competition for nutrients alternation of enzymatic activity of pathogens, immune stimulatory functions and nutritional benefits improving feed digestibility and feed utilization (Fuller,1989;fooks et al;1999;Bomba). Knowledge of probiotics has increased, currently it is known that these microorganisms have an antimicrobial effect through modifying the intestinal micro biota, secreting antibacterial substances competing with pathogens to prevent their adhesion to the intestine, competing for nutrients necessary for pathogen survival, and producing an antitoxin effect. Probiotics are also capable of modulating the immune system. Probiotics favorable affect host health. (D. Myers 2007). Although the use of probiotics in Aquaculture is relatively recent, interest in them has increased due to their potential in disease control (Y.B. Wang, 2008).

3. Mode of actions and salient features of probiotics

The mechanism of action probiotics bacteria has not been systematically studied so far in different species under different environmental conditions especially under field conditions. Probiotic bacteria enhance provision of essential nutrients of the cultured animal and secretion of digestive enzymes to augment digestion. probiotics produce antibacterial compounds like organic acids, hydrogen peroxide (H2O2) and even antibiotics by anaerobic bacteria which may competitively exclude pathogenic bacteria and special metabolites' like vitamin –B, which lead to better nutrient utilization. It has been hypothesized that lactobacilli may have some potential role play in the immune system of the host Immunostimulants have been tested on fish and shell fish and some might have originated from microbial cell walls (Anderson, 1992).

3.1. Growth promoters

Probiotics have been used in Aquaculture to increase the growth of cultivated species, in reality it is not known whether these product increase the appetite, improve digestibility. Probiotics actually taste good for aquaculture species (A.Irianto and Austin, 2002). According to Balcazar et al., (2006). probiotic microorganisms are able to colonize gastro intestinal tract administered over a long period of time because they have a higher multification the role of expulsion, so as probiotics constantly added to fish cultures. This also depends on factors such as hydrobionts species, body temperature, enzyme levels, water quality (Balcazar et, al 2006). The effect of probiotics has been tested on phytoplankton, which forms the basis of Aquatic food chains, due to its nutrient producing photosynthetic machinery that is most cases, higher organisms are unable to synthesize such is the case of polyunsaturated fatty acids and vitamins. (R.c Medina and. E.B. Cordero 2011).

Probitics harmonize the growth of intestinal micro biota, vanquish potentially harmful, bacteria and booster up the body's natural defense mechanisms, and thus ameliorate resistance against infectious diseases. Bacterial probiotics do not have a mode of action but act on species specific or even strain specific and immune responses of the animal, and their interaction with intestinal bacterial communities plays a key role. probiotics bring out inhibitory substances which might be antagonistic to the growth of pathogens in the intestine.

3.2. Role of probiotics on immune response of fishes

The non specific immune system can be stimulated by probiotics. It has been demonstrated that oral administration of clostridium butyricum bacteria to rainbow trout magnified the resistance of fish to vibriosis, by increasing the phagocytes activity of Leucocytes. (Sakai M, 1995). Rengpipat et al; reported that the use of bacillus sp. (strains 11) has provided diseases protection by activating both cellular and hum oral immune defenses in tiger shrimp. Fish have an immune system found in vertebrates, crustaceans have highly developed, specialized non –specific immune system which includes agglutinins, killing factors, Lysine, precipitins, clotting agents and prophenoloxidase cascade system (Smith and Sorderhall, 1986). The use of beneficial bacteria to displace pathogens through competition is being used in the animal industry as preferable method to administering antibiotics and is now gaining acceptance for the control of pathogens in Aquaculture (Moriarty, 1999; Nikoskelaineh et al.2003). Recent studies have demonstrated that no specific immune responses stimulated by the supplementation of probiotics to the diet or to the culture water. The colonization rate of the bacteria in digestive tracts has been reported depending on the level of bacteria in the feed (Bagheri et al., 2008). The administration of a mixture of bacterial strain bacillus sp. and vibrios sp. positively influenced the growth and survival of white shrimp juveniles and gave a protective effect against pathogens William Harvey and White spot syndrome virus. Increasing phagocytosis and antibacterial activity (Balcazar, 2006).

3.3. Source of nutrients and enzymatic contribution to digestion

Microorganisms have a beneficial effect in the digestive processes of aquatic animals. In fish it has been reported that bactericides and clostridium sp. have contribution to the host‘s nutrition especially by supplying fatty acids and vitamins (Sakata, 1990). Besides bacterial probiotics, many strains of yeast have been used as dietary supplements in a number of fish species (Tinh et al.2007). Some micro organisms have a positive effect in the digestive processes of aquatic animals (Balcazar et al. 2006). Some bacteria contribution in the digestive process by producing extracellular enzymes, such as proteases, lipases, as well as growth promoting factors (Wang et al. 2000). The effect of incorporating Bacillus subtitles, isolated from the intensive of Cirrhinus Mrigala into their has been evaluated. The result shows an increase in the length and weight of the ornamental fishes as well as the specific activity of proteases and amylases in the digestive tract. (S.Ghosh, A.Sinha, C. Sahu (2008). Bacillus secretes a wide range of exo enzymes that complement the activities of the fish and increases enzymatic digestion. In fact, the bacteria isolated from the digestive tract of aquatic animals have shown chitinases, proteases, celluloses and trypsin. (N.G.vine (2006). Probiotics can also influence the digestive processes by improving the microbial population and by enhancing the enzyme activity that contributes to more efficient digestion and food utilization. The supplementation of yeast HUPA-enrichedyeast and treated yeast cells with beta -mercapto- ethanol improved rainbow trout growth and may be possibly due to improved nutrient digestibility Tukmechi et al., (2011). The significance of bacterially produced enzymes to host health in vivo remains unclear and thus additional studies are needed to characterize enzyme contribution to the host. The probiotic after transmit through the stomach attached in the intestine and use a large number of carbohydrates for their growth and produce relevant digestive enzymes (Amylase, protease, lipase) that increase the digestibility of organic matter and protein, produce a higher growth prevent the intestinal disorders and produce and stimulate a pre-digestion (Lara-Floreset al., 2003: E1 –Haroun et al., 2006). Micro biota may serve a supplementary source of food and microbial activity in the digestive tract may be a source of vitamins and essential amino acids (Dall and Moriarty, 1983).

3.4. Role of probiotics in water quality management

Maintenance of water qualityis an integral part ofany Aquaculture systems as the culturelevels of intensifies, the number of animals stockedper unit area would also increase, heavy feeding and fertilization resultingin greater accumulation of nitrogenous waste leading to eutrophication and anaerobic decomposition. This would cause stress to culture species which makes them vulnerable to attack by pathogens resulting disease out breaks. Thus it is mandatory to main water quality in Aquaculture systems. Micro organisms are known to play an important, role in nutrient recycling in aquatic environments (Anderson, 1987; Coleman and Edwards 1987; Rheinheimer, 1992). Micro organisms such as bacteria, fungi and protozoa exist ubiquitously in all aquaculture systems. Heterotrophic microorganisms consume oxygen and release carbon dioxide and ammonia oxidizing organic matter. In contrast, autotrophic nitrifying and sulfur bacteria consume oxygen and carbon dioxide (Co_2). While oxidizing ammonia, nitrite and hydrogen sulfide. The inorganic nutrients thus produced will be used by the phytoplankton to fix to carbon and to release oxygen, which in turn will be used by micro organisms. This process of self purification will go under normal conditions i.e. conditions where there is low stocking density, optimum feeding and fertilizer input. Exchange of water improves water quality but there is a possibility of environmental pollution associated with it. Thus there is a real need to reduce the load of accumulated waste through bioremediation processes by probiotic use. The process of maintaining environmental bioremediation, managing microbial communities to control disease causing organisms is otherwise known as microbial biotechnology (Moriarty, 1997). Application of

Gram- positive bacteria, such as Bacillus spp., is beneficial in improving the quality of the water system. Bacillus spp. have a more efficient ability inconverting organic matter into carbon dioxidein comparisonto the Gram-negativebacteriawhich converts a greater proportion of organic matter in tobacterial biomass (Balcazaret al., 2006; Mahapatra et al.2012). Gram positive bacteria are better converting organic matter into Co_2 than gram negative bacteria, thus during a production cycle, higher levels of these bacteria can reduce the accumulation of particulate carbon. Thus, maintaining higher levels of these Gram-positive bacteria production pond, farmers can minimize the buildup of dissolved and particulate organic carbon during the culture cycle, while promoting more stable phytoplankton blooms through the increased production of carbon dioxide (Co_2). (L. Verschuere, G. Ram bout, P. Sorgeloss). The microbial cultures produce a variety of enzymes such as amylase, protease, lipase, Xylase and cellulose high concentrations than the negative bacteria, which help degrading the weight these bacteria have a wide range of tolerance for salinity, temperature and P^H (Hemaiswarya et al., 2013)·Ecologically harmless method of maintainingproper pond chemistry and environments for fish and shrimp, Aquaculture operations, but Aqua culturists have the trend to change the water regularly from the hatchery (Raj 2011). The use of probiotics in aquaculture is the improvement of the water in the farming nurseries. Increase in organic load, levels of phosphorous and nitrogen compounds are growing concerns in Aquaculture (Boyd).

3.5 Inhibition of pathogens

Antibiotics were used for a long form in aquaculture of prevent diseases in the crop, this causers various problems such as the presence of antibiotic reduces in animal tissues, the generation of bacterial resistance mechanisms, as well as an imbalance in the gastrointestinal microbiota of aquatic species which affected their health (T. Nakano,2007). Probiotics administered to Tilapia oreochromis nilotricus, increased immune response, determined by parameters such as lysozyme activity bactericidal activity, which improved the resistance of fish to infection by Edwards's ell. (Taoka, 2006). Probiotics promote the development of healthy micro biota in the gastro intestinal fishes. Decrease the amount of heterotrophic microorganisms. S. Ghash, 2008). Probiotic micro organisms have the ability to release chemical substances with bactericidal or bacteriostatic effect on pathogenic bacteria that are in the intestine of the host, thus constituting a barrier against the proliferation of opportunistic pathogens. In general, the antibacterial effect is due to one or more of the following factors: productions of antibiotics, bacteriocins, siderophores, enzymes (lysozymes, proteases) hydrogen peroxide, as well as alteration of the intestinal PH due to the generation of organic acids. (L.Verschuere, G.Rombaut, P.Sogeloos, and W.Verstraete, 2000).

4. Stress tolerance

Aquaculture practices demand intensive productions in shorter times, causing stress in crop species. For example, it has been reported that chronic stress in zebra fish, Danio rerio, induces a general depression on the synthesis of muscle protein (S.Vianello, 2003). As a result, it was sought to increase stress tolerance by using probiotics. One of the first formal reports on this field studied the supplementation of Lactobacillus Delbrueckii sp.delbrueckii in the diet of European sea bass, at time intervals of 25 to 59 days. In addition to evaluating the growth improvement, hormone cortisol was quantified in fish tissue as stress marker, since it is directly involved in the animal's response to stress (O.Carnevali, 2006). Another way to assess stress in fish involve subjecting them to heat, shock, as in the case of Japanese flounder grown in a recirculation system (Y.Taoka, 2006). Lactate and plasma glucose levels are considered appropriate indicators of stress as they increase as a secondary response during periods of stress to cover high energy requirements induced by this situation. Therefore, varela et al. have conducted studies on the gilt-head bream the glycogen and triglycerides reserves in the livers of the control group were significantly decreased in relation to concentrations obtained when the fish feed was supplemented with the probiotic Alteromonas sp.strain pdp 11(J.L. Varela, I.Ruiz, L.Vargas et al.,2010). The results obtained so far rise the possibility of preparing the fish in advance with probiotic treatment, for conventional aquacultures practices that creates stress in animals, such as transport, change in water temperature, and periodic manipulations (P.A. Tapia, R.P. Diaz, R.J. Leon et al.,2012).

5. Effect on Reproduction of Aquatic Species

Accordingto lzquierdo *et al.*(2001). Breeding aquaculture species have high nutritional requirements, thus reproductive capacity depends on appropriate concentrations of lipids, proteins, fatty acids, vitamins C and E, and corticoids. Furthermore, the relationship of these components influences reproduction in various processes such as fertility, fertilization, birth and development of larvae. At present, for most cultured fish species, there are commercially available "brood stock diets "that just are larger-sized diets. In practice, many fish hatcheries improve the nutrition of their bloodstock by feeding them solely on fresh fish byproducts or in combination with commercial diets. The most common fresh organisms used to feed bloodstock fishes include squid, cuttlefish, mussels, krill, and small crustaceans. Therefore, probiotics added to food or water was used in order to prevent infections and to explore their effect on reproduction. The pioneer study on the effect of probiotic supplementation on reproductive performance of fish was carried out by Ghosh et al. (2007).

6. Safety Considerations of Probiotics

Traditionally, probiotics used in food industry have been deemed safe, in fact, no human risks have been determined, remaining as the best proof of its safety (M.Saxelin, 1996). Theoretically, probiotics may be responsible for four types of side effects in susceptible: systemic infections, deleterious metabolic activities, excessive immune stimulation, and gene transfer. Lactic acid bacteria that are regarded as probiotics, the resistance to antibiotics can be linked to gene on chromosomes, plasmids, or transposes. However, there is insufficient information about the circumstances in which these genetic elements could be mobilized (FAO/WHO, 2006). Efficiency and safety of probiotics, FAO and WHO recognized the need to create guidelines for a systemic approach for the evaluation of probiotics in food, in order to substantiate their health claims, the evaluation of probiotics, based on scientific evidence (M.Pineiro and C.Stanton, 2007). as a result the “Guide for the Evaluation of probiotics in food” was presented, providing guidelines on the evaluation of health and nutrition properties of probiotics in food (FAO/WHO, 2006).The use of probiotics in animal models including mice, rats, and fish has revealed specific determinants of virulence or pathogen city of the studied probiotic micro organisms, suggesting the overall safety of them (S.J.Lahtinen, 2009).

Different applications of Probiotics in Aquaculture.

Application	Identity of the Probiotic	Applied to Aquatic Species	Reference
Growth Promoters	Bacillus sp. S11	Penaeus monodon	[80]
	Bacillus sp.	Cat fish	[81]
	Carnobacterium divergence	Gadus morhua	[82]
	Alteromonas CA2	Crassostrea gigas	[83]
	Lactobacillus Helveticas	Scophthalmus maximus	[84]
	Lactobacillus lactic AR21	Brachionus plicatilis	[85]
	Streptomyces	Xiphophorus helleri	[86]
	Lactobacillus Casei	Poeciliopsis gracilis	[87]
	Bacillus NL 110,Vibrio NE 17	Mcrobrachium rosenbergii	[88]
	Bacillus Coagulants	Ciprinus Carpio Koi	[89]
Pathogen Inhibition	Enterococcus faecium SF 68	Anguilla Anguilla	[90]
	Lactobacillus Rhamnosus ATCC 53103	Oncorhynchus mykiss	[91]
	Micrococcus lutens A1-6	Oncorhynchus mykiss	[92]

	Pseudomonas fluororescens	Oncorhynchus mykiss	[93]
	Pseudomonas fluorescence AH2	Oncorhynchus mykiss	[94]
	Pseudomonas sp.	Oncorhynchus mykiss	[95]
	Rosebacter Sp. BS.107	Scallop larvae	[96]
	Rosebacter Sp. BS.107	Scallop larvae	[96]
	Vibrio alginolyticu	Salmonoid	[97]
	Tetra eslmis svecica	Salmosalar	[98]
	Lactobacillus acidophilus	Clarias gariepinus	[99]
Nutrient digestibility	Lactobacillus Helveticas	Scophthalmus maximus	[84]
	Bacillus NL 110,Vibrio NE 17	Macro brachium Rosenbergii	[88]
	Carnobacterium sp. Hg4-03	Hepialus gonggaensis larvae	[100]
	Lactobacillus acidophilus	Clarias gargiepinus	[101]
	Shewanella putre faciens pdp 11	Solea Senegalensis	[102]
Water quality	Bacillus sp. 48	Penaeus Monodon	[103]
	Bacillus, NL 110, Vibrio Sp. NE 17	Macro brachium Rosenbergii	[88]
	Lactobacillus acidophilus	Clarias gargiepinus	[101]
	Bacillus Coagulants' Sc 8168	Penaeus Vennamei	[104]
	Bacillus Species.,Saccharomyces Sp.	Penaeus monodon	[104]
Stress-Tolerance	Lactobacillus delbrueckii	Dicentrachus Labrax	[105]
	Alteromonas Sp.	Sparus auratus	[106]
	Lactobacillus Casei	Poecilopsis gracilis	[87]
	Pedicoccus acidolactici	Litopenaeus Stylirostris	[107]
Reproduction improvement	Bacillus subtilis	Poe cilia reticulate, Xiphophorus Maculatus	[108]
	Lactobacillus Rhamnosus	Danio rerio	[109]
	Lactobacillus acidophilus, L. Casei, Enterococcus faecium, Bifidobacterium	Thermophilum	[110]

CONCLUSION

The use of Probiotics will gradually increase scientific investigation and may prove to be a boon for the Aquaculture industry. Now a days, probiotics are becoming an integral part of the aquaculture practices for improving growth and disease resistance and obtaining high production. The use of probiotic bacteria as biological control agents should be considered as an alternative to the chemotherapeutic agents commonly used in Aquaculture for disease prevention. The selection and production of probiotic need to be accepted to a range of environmental conditions. The decision of using probiotics in aquaculture has been in large part of a result of historical and empirical use and not based on scientific criteria. The use of probiotics is an important management tool, but its efficiency depends on the nature of competition between species or strains. Increased use of antibiotics has led to the high proportion of antibiotic resistant bacteria which provide threat to fish and man through consumption of the infected fish. Inefficiencies in the antibiotic treatment of fish illness lead to significant economic losses. But the use of probiotics in aquaculture has shown to have beneficial impact on fish health and thereby Economic performance of fish farming. Some studies have proved that the use of probiotics can be an alternative method for the protection of aquatic animals against diseases. Finally we can say that probiotic bacteria can improve the utilization of feed with a lower Feed conversion ratio (FCR) by producing digestive enzymes, while the Aquaculture sector is facing the problem of shortage of fish meal for protein sources.

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