

## Probiotics and their Uses in Aquaculture

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### Article History

Received: 12 May 2020

Revised: 27 May 2020

Accepted: 6 June 2020

### INTRODUCTION

“Probiotics” word has evolved from two Greek words, “pro” and “bios” which means “profile”. Parker (1974) first introduced the term “Probiotic” and also defined it as “organisms and substances that contribute to intestinal microbial balance”. Several new definitions were given by different researchers due to advancement of research and technology. According to Fuller (1989) “Probiotics are cultured products or live microbial feed supplements, which beneficially affect the host by improving the intestinal microbial balance”. It may also be defined as a monoculture or mixed culture of living micro-organisms which help to improve the qualities of microflora present in the gut. These are microbial cells which are applied in the gastrointestinal tract for betterment of health of the host. World Health Organization has defined “Probiotics” as “live micro-organisms which when administered in adequate amounts confer a health benefit to the host”. For many years, intestinal micro-organisms used as “probiotics” were gram-positive strain of lactic acid bacteria eg. *Lactobacillus*, *Streptococcus* and *Bifidobacterium sp.* With course of time and advancement in research many strains of bacteria were included in the list of “Probiotics” which include gram positive strains eg. *Bacillus*, *Brevibacillus*, *Clostridium*, *Lactococcus*, *Microbacterium*, *Micrococcus*, *Carmobacterium*, *Streptococcus* etc as well as gram negative strains eg. *Aeromonas*, *Agarivorans*, *Alteromonas*, *Enterobacter*, *Pseudomonas*, *Roseobacter*, *Vibro* etc.

**Cite this article:** Jakhar, V. (2020). Probiotics and their Uses in Aquaculture, *Agrospheres:e-Newsletter*. 1(2), 14-16.

Aquaculture is a farming system in which fishes and other aquatic animals are reared for human consumption, industrial use and sports activities. Indiscriminate applications of antibiotics has resulted in the development of antibiotic resistance in pathogenic bacteria. As a result, aquaculture production has drastically declined due to spread of diseases and excessive exploitation of fishes and other aquatic animals by man. Many alternative methods have been applied to increase the production and improve the quality as well as sustainability of water animals. Out of these methods, use of “probiotics” has been considered as the best practice because they have ability to improve the quality of rearing water, to stimulate the physiological and immunological properties of aquatic animals and it also helpful of decrease the use of antibiotics and other chemicals in aquaculture.

#### Uses of Probiotics in Aquaculture

“Probiotics” used in aquaculture mainly belong to *Bacillus*, *Bifidobacterium* and *Lactobacillus* species of bacteria and yeast *Saccharomyces cerevisiae*. The “probiotics” can be applied direct in water as “monoculture” or “mixed culture”. In mixed culture, probiotics are mixed with pre-biotics or other additive called “Synbiotic”. It has been reported that “synbiotic” application has increased the percentage of survival, growth and stress tolerance capability in aquatic organisms. Commercial products of “Probiotics” may be applied in aquaculture in form of liquid or powder forms but alginate encapsulated microbes are the best form of probiotics given to aquatic life because capsule protects the microbes from acidic enzymes of stomach and it generally releases the microbes in the gut where it is required. “Probiotics” have many uses in aquaculture and some important applications of “Probiotics” are discussed in this article.

- **Improves quality of water** - “Probiotics” are the best form of microbes which are capable to improve the quality of water by killing harmful bacteria, increasing the

organic matter decomposition; reducing nitrogen & phosphorus amount; controlling H<sub>2</sub>S and NH<sub>3</sub> production and by reducing the accumulation of organic matter in water.

- **Improves growth & survival rate** - Use of “probiotics” has increased the growth of fishes, prawns and other aquatic animals. It has also been reported that probiotics have capability to increase the rate of survival because they increase the gut digestion and absorption capacity in aquaculture.
- **Inhibits growth of pathogens** – “Probiotics” have the ability to produce chemicals which can kill the pathogenic bacteria proliferating in the host’s gut by producing bacteriocins, lysozymes, proteases and hydrogen peroxide.
- **Improves digestion of nutrients** - Studies have shown that “probiotics” have a positive effect on digestion of aquatic animals because they produce enzymes proteases, lipases and amylases as well as produce growth promoting factors like fatty acids, vitamins and amino acids. So, feed for aquaculture containing “probiotics” helps in the absorption of nutrients more efficiently in their gut.
- **Enhances immune responses** – “Probiotics” have been found to increase the immunity of fishes, prawns and shrimps as they increase the number of erythrocytes, leucocytes & lymphocytes and also enhance the phagocytic activities of monocytes.

#### CONCLUSION

Problem of food crisis has increased at global level due to COVID-19 pandemic and other factors. Fresh water and sea foods can become a good alternative to meet out the increasing demand of food in the world. Several techniques and methods have been used by many scientists to enhance the aquatic food production for human consumption. Use of “probiotics” in aquaculture has enormous

scope to increase the quality and quantity of aquatic food. In the last ten years, fish production has enhanced considerably because of use of probiotics. Though, “probiotics” have many uses in aquaculture production, yet there is need of further advanced research in this field. There is need to do work to diagnose specific microbial strain for a particular target aquatic species in an environment. It is also suggested to do work to find the cause of immune-suppression due to continuous use of over-doses of specific probiotics. In near future, studies will also be conducted on gene transmission from probiotics to other microbes and their impact on humans. Consequently, further research on use of probiotics in aquaculture will ensure the safe and secure organic aquatic food for human consumption.

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