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PROBIOTICS: SUSTAINABLE APPROACH IN AQUACULTURE

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A substitutional approach for fish health management is seeking great attention in the aquaculture industry is 'PROBIOTICS', a microbial intercessional approach. Fish health as well as fish growth has been impacted quite positively by the probiotics and made a unique place in the history of aquaculture. It is a safeguard provided for human health, these special food additives are to be promoted which could help in improving the productive performance and feed utilization as well as boosting the fish production. It also provides good water quality management for aquaculture fish species which can further provide sustainable aquaculture.

Probiotics, as 'bio-friendly agents' such as lactic acid bacteria and *Bacillus* spp., can be introduced into the culture environment to regulate and compete with pathogenic bacteria as well as to stimulate the development of the cultured species (Farzanfar, 2006). Encouraging these fish feed additives will help to increase product performance and feed utilization, hence increasing fish productivity as well as protecting human health (El-Saadony *et al.* 2021).

Aquaculture is seen as an essential food security industry for the world's rising human population, and it has grown rapidly as a result of improved cultural practices. Indiscriminate use of chemical additives and veterinary medicines as prophylactic and remedial measures for infections has resulted in antimicrobial resistance among pathogenic bacteria, and degraded environmental circumstances (Bachere, 2000). Probiotics are defined as "a live microorganism's adjunct that has a favorable effect on the host by modifying the host-associated or ambient microbial population, ensuring increased nutrient use or nutritive quality, improving the host immune response to disease, or increasing the quality of the host's ambient environment." The important defined of probiotics in the neighborhood of fish farming sector was also concerned with "organic wastes" and "pollutants", as a consequence

of the incorporation of "bioremediation" as well as "biocontrol" when bargaining with environmental difficulties (Verschuere *et al.* 2000).

Types of Probiotics

Probiotics are primarily of two types used in the aquaculture sector.

1. Gut probiotics, which can be mixed with feed and ingested orally to improve the beneficial microbial flora of the gut; and
2. Water probiotics, which can propagate in water medium and exclude pathogenic bacteria by having consumed all accessible nutrients. As a result, the harmful bacteria are completely eliminated by starvation (Nageswara and Babu, 2006).

Selection Methods of Probiotics

The strategies for selecting probiotic bacteria for use in aquaculture include

- i. Gathering background knowledge;
- ii. (ii) Acquiring potential probiotics;
- iii. (iii) Assessing the ability of potential probiotic microorganisms to outcompete pathogenic strains;
- iv. (iv) Evaluating the pathogenic organisms of the potential probiotics;
- v. (v) Assessing the effect of the potential probiotics in the host; and
- vi. (vi) Economic cost/benefit assessment (Gomez-Gil *et al.* 2000).

Probiotics used in Aquaculture

Probiotics work by supplying nutrient sources, enzymes for improved digestion, modulating the immune response, and boosting the immune system response to pathogenic bacteria. Lactic acid bacteria like *Lactobacillus* sp., *Bacillus* sp., *Enterococcus* sp., as well as yeast-like *Saccharomyces cerevisiae* are the most widely accepted probiotics used in fish farming.

Probiotics' Mode of Action

According to Fuller (1987), the most likely modes of action are

- ✓ Stimulus of humoral and/or cell-mediated immunity;

- ✓ Adjustment of microbial metabolism by increasing or decreasing relevant enzyme levels; and
- ✓ Competitive exclusion, in which the probiotic antagonizes the prospective pathogen by producing inhibitory compounds or competing for nutrient content, space ($\frac{1}{4}$ adhesion sites in the digestive system), or oxygen.

Application of Probiotics in the Aquaculture Sector

Growth promoter

Probiotics have been used in fish farming to stimulate the growth of fish farming species; however, it is unknown whether these products increase appetite or, by definition, enhance digestibility. Some people believe that it could be a combination of both factors; it would also be helpful to evaluate whether probiotics taste better for aquaculture species.

Improve water quality

Probiotics are beneficial in enhancing water quality in a variety of ways. They improved organic material decomposition, diminished nitrogen and phosphorus concentration levels, and managed ammonia, nitrite, as well as hydrogen sulphide (Boyd and Massaut, 1999; Ma *et al.* 2009; Cha *et al.* 2013).

Probiotics for nutrients digestion

Taking benefit of non-aquaculture business sectors' knowledges, as well as for safety reasons, a few lactic acid bacteria and yeast strains have been immediately accepted as probiotics in fish farming. Lactic acid bacteria are among the most frequently used organisms in probiotic preparations; they are found in high concentrations in the guts of healthy animals and, according to the American Food and Drug Administration (FDA), are usually recognized as secure (GRAS status) (Parvez *et al.*, 2006).

Conclusion

Probiotics have been used in aquaculture to promote the growth of cultivated species. The greatly commonly utilized organisms in probiotic preparations are the lactic acid bacteria; these are found in huge numbers in the gut of healthy animals. Probiotics are efficiently used in the aquaculture sector for growth promoters of fish species, improve water

quality, and Microorganisms for nutrients digestion. Some commercial probiotics are also available in the market.

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