MICROBIAL ECOLOGY - ITS FUNDAMENTAL ROLE IN SUSTAINABLE AQUACULTURE

For intensive aquaculture to become a sustainable industry with minimal environmental impact microbial ecology is critically important as a scientific discipline; applications of microbial ecology are needed at the forefront of advances now being made. Water quality and the control of disease are interdependent and linked to the microbial, especially bacterial, activities in ponds. Microbial food webs are an integral part of all aquaculture ponds and have a direct impact on productivity. The crisis in the shrimp industry over the last few years has arisen, to at least some extent, because the interactions of bacteria and their effects on animals and their environment, at intensive production scales, have either not been considered as important, or have been treated only from a clinical pathology perspective. In other words, the disease or it's the end result, was often treated rather than the underlying cause.

In attempting to treat problems at an earlier phase, some farmers add bacteria to try and change the activity and thus water chemistry. Manipulation of bacterial populations has been practiced with success in many areas, e.g. Rhizobium inoculation of legumes, bioremediation of soil and probiotic usage in the animal industry. The use of beneficial bacteria (probiotics) to displace pathogens by competitive processes and by release of growth inhibitors is now gaining acceptance in the animal industry as a better, cheaper and more effective remedy than administering antibiotics and has considerable potential for the control of pathogens in aquaculture. In aquaculture, there is now evidence that it is feasible, and indeed commercially profitable for shrimp farmers, to manage and change the bacterial populations in ponds.

Success will depend on several important factors, including defining the ecological process or processes to be changed, the species that are naturally dominant and the desirable alternative species that could be added. Competitive exclusion is one of the ecological processes that can be manipulated to modify the species composition of soil or water body or other microbial environments. Whether we can change a bacterial community depends on knowing enough about the ecological factors that govern species composition, including specific growth rates, nutrient composition and concentration, inhibitory interactions and the types of bacteria already present. Both stochastic (chance events such as relative numbers of particular species present at a particular time) and to make it worthwhile manipulating bacterial species composition in aquaculture ponds. It is necessary to both manipulate physico-chemical factors to alter rates of metabolic activity by adding selected species to carry out particular functions at faster rates than those present in a given system.

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