

Feed probiotics for sustainable aquaculture

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The practice of using antibiotics and chemotherapeutants indiscriminately for the treatment of diseases in aquaculture could result in the accumulation of residues and development of resistant strains of bacteria. Owing to the greater consumer concern about the danger of antibiotic residues and resistant pathogenic strains of bacteria, the need for the use of biological or probiotic feed additive is increasing. In general, probiotics are single or mixed cultures of selected strains of bacteria which have varied beneficial effects.

Although many commercial probiotic feed supplements are available for use in livestock feeds, the use of probiotics in aquaculture feed is still being studied.

Probiotics: definition and concept

Fuller (1986) defined "probiotics" as "live microbial feed supplement which beneficially influences the host by improving its intestinal balance." The oral administration of probiotics would help in the colonization by probiotic organisms of the gut of the host. It then prevents pathogenic organisms from colonizing the gut due to competition for adhesion sites (which is termed "competitive exclusion").

The use of probiotics promotes the utilization of feed.

Potential probiotic organisms

The most commonly used microbes as probiotics in animal nutrition include: lactic acid bacteria such as *Lactobacillus acidophilus*, *Streptococcus faecium*, *Pediococcus* sp., selected strains of *Bacillus* sp., and certain strains of yeast belonging to *Saccharomyces* sp. Many researches are being carried out to identify the potential probiotic strains which would be of immense help to aquaculture.

Mode of action of probiotics

The mode of action of probiotics as evident from earlier works could be summa-

rized as follows:

- The probiotic microbes adhere and colonize the gut of fishes, thereby preventing pathogens from inhabiting the gastro-intestinal tract (Montes & Pugh 1993)
- The probiotics produce organic acids and hydrogen peroxide thereby reducing the pH of the gut. The reduction in pH in turn inhibits the growth of pathogenic microbes
- The probiotic organisms produce specific compounds like bacteriocins which are known to inhibit pathogens, including *Staphylococcus aureus*, *Aeromonas hydrophila*, *Listeria monocytogens* (Lewus et al. 1991)
- The probiotics increase the feed conversion efficiency and weight gain as they are known to play a key role in digestibility and utilization of feeds
- These beneficial microbes are also known to stimulate the non-specific defense mechanism in the host and protect them against pathogens. It should be noted that unlike fishes, shrimps mostly rely on the non-specific defense system; hence, theoretically, the use of probiotics in shrimp and other crustacean feed could enhance the immune status of shrimp in a better manner when compared to incorporation in fish feed
- Probiotics are also shown to exhibit anti-cancer effects (Fernandes & Shahani 1990)

Studies on the use of probiotics in aquaculture showed beneficial effects in the shrimp hatcheries and farms. Use of live food organisms such as *Artemia* and

rotifers to feed the larval stages of fishes and crustaceans is a common practice in hatcheries. At times, such live food organisms serve as carriers of pathogens. Feeding them to fishes and crustaceans is likely to cause infection to larvae. With probiotics, quality seed production is possible. Larval feeds can be enriched with probiotic bacteria through bioencapsulation. Although bioencapsulation is becoming popular, further studies on its effectiveness are needed.

Sunilkumar (1995) observed that the growth and survival of giant tiger shrimp *Penaeus monodon* postlarvae (PL) were higher when PL were fed heterotrophic bacteria (*Pseudomonas* sp. and *Micrococcus* sp.) as partial replacement (50%) of the diatom feed.

Uma (1995) studied the effectiveness of a commercial probiotic feed supplement containing *Lactobacillus* sp., *Streptococcus* sp. and *Saccharomyces* sp. (yeast) on the growth, survival and immune status of white shrimp, *Penaeus indicus*. The shrimp fed probiotic-supplemented feed showed a higher growth, survival and better immune status as evident from higher survival in the experimental injection with *Vibrio* pathogen. Many similar studies have shown that use of probiotics would prove beneficial in aquaculture. However, more research has to be carried out to identify many other probiotic strains, their effective dosages, and effective routes of administration for sustainable aquaculture.

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New waste disposal system for poultry-fish culture

By T Muthu Ayyappan

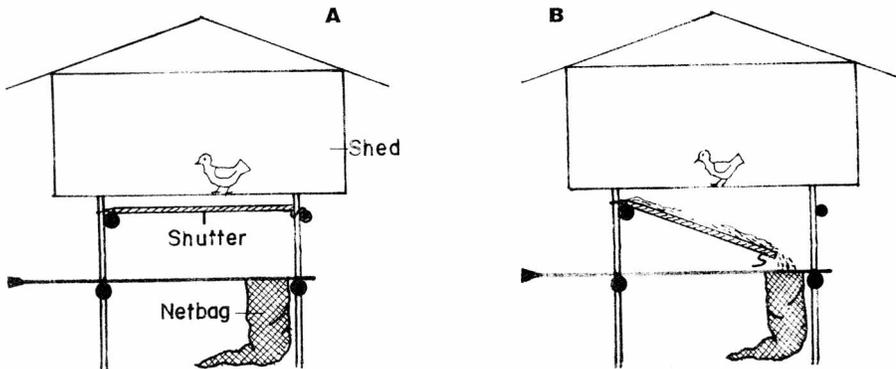
In poultry-cum-fish culture, the droppings of birds form a valuable source of manure for pond culture. It also serves as a direct food for the growing fish.

But bird wastes can not be left where these are dropped by birds in the pond because these just accumulate, becoming of little use to farmers. Collection of wastes from bird sheds and adding them to the pond is inconvenient and time-consuming. This article describes a new system that overcomes these disadvantages.

Collecting bird droppings

To collect bird droppings, the shutter is released from the shed bottom. The slope of the open shutter makes the droppings fall into the net bag (figure B). The net bag is moved through the pond near the surface of the water. The long handle pole makes this work easy and convenient.

This process may be done periodically as required.



Construction

The floor of the bird shed is made up of loosely packed frames of bamboo or other suitable local material. Below the shed floor is a shutter made up of closely packed frames. The shutter is fixed under the floor with a hinge on one side. A hook system is provided on the other side to lock or release the shutter when required. A net bag of small mesh size with rectangular mouth frame and a long handle is kept under the shed on two carrier rods. See figure A.

Uses

- The application of this system prevents eutrophication as bird wastes are no longer accumulated at one site
 - Waste collection is convenient and time-saving
 - Frequent collection of wastes minimizes the risk of disease outbreaks in birds
 - Bird droppings can be spread more evenly throughout the pond as fertilizer or fish food
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