

Biofloc Technology in Aquaculture

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INTRODUCTION

Biofloc technology is a technique of enhancing water quality through the addition of extra carbon to the aquaculture system, through an external carbon source or elevated carbon content of the feed. This promoted nitrogen uptake by bacterial growth decreases the ammonium concentration more rapidly than nitrification process. Biofloc in suspension in ponds consists of phytoplankton, bacteria, aggregates of living and dead particulate organic matter and grazers of the bacteria.

1. The strengths of biofloc technology

Biofloc technology makes it possible to minimize water exchange and water usage in aquaculture systems through maintaining adequate water quality within the culture unit, while producing low cost bioflocs rich in protein, which in turn can serve as a feed for aquatic organisms. Conventional technologies to manage and remove nitrogen compounds are based on either earthen treatment systems, or a combination of solids removal and nitrification reactors.

These methods have the disadvantage of requiring frequent maintenance and in most instances the units can achieve only partial water purification. They generate secondary pollution and are often costly. Biofloc technology, on the other hand, is robust, economical technique and easy in operation.

The strength of the biofloc technology lies in waste recycling. The nitrogen generated by uneaten feed and excreta from the cultured organisms is converted into proteinaceous feed available for those same organisms. Instead of 'down cycling', a phenomenon often found in an attempt to recycle, the technique actually 'up cycles' through closing the nutrient loop. Hence, the water exchange can be decreased without deterioration of water quality and, consequently, the total amount of nutrients discharged into adjacent water bodies may be decreased.

1. Implementation of biofloc technology in aquaculture

A major obstacle is to convince farmers to implement the technique, since the concept of biofloc technology goes in against common practice that water in the pond has to be clear. A very important aspect in the implementation of biofloc technology in aquaculture is monitoring of the ponds. Biofloc technology is not yet fully predictable and can therefore be risky to implement at farm level. Possible monitoring tools are the concentration of total suspended solids or bioflocs, and the amount of biofloc, which can be measured quickly and easily. The technique is useful and cost-effective especially for recirculating aquaculture. The use of biofloc technology ponds integrated in a polyculture set-up is also an inventive and promising approach. Biofloc technology is combined with poly culture ponds, further enhancing the water quality, natural food availability, dietary preference, growth and production in tilapia and shrimps.

2. The use of bioflocs as a feed

Fishmeal and fish oil are essential elements of the diet of many aquaculture species, both carnivorous and herbivorous fish and shrimp.

With biofloc technology, where nitrogenous waste generated by the cultivated organisms is converted into bacterial biomass containing protein, in situ feed production is stimulated. It is also necessary to take into account capability of fish in dealing with high suspended solid concentrations, since this negatively affects certain fish species. Different organic carbon sources stimulate specific bacteria, protozoa and algae, and hence influence the microbial composition and community organization of the bioflocs and thereby also their nutritional properties. Feeding experiments revealed that besides these characteristics, the type of carbon source also influenced the availability, palatability and digestibility for the cultured organisms.

3. Bioflocs as a bio control measure

Bioflocs constitute possible alternative measure to fight pathogenic bacteria in aquaculture. Shrimp are found to be the healthiest and grow best in aquaculture systems that have high levels of algae, bacteria and other natural biota. Bioflocs might also contain immune stimulatory compounds since biofloc technology deals with bacteria and bacterial products.