

Biofloc: An aquaculture environment-friendly technique

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Introduction

As we all aware about the demand of food with the increase of population all over the world specially the country like India where the increasing population is among the biggest concern (FAO2019).It is the big challenge to fulfill the requirement of nutrient of all the population, in India there are approx 189million people are found undernourished, they all need to fulfill this nutrient requirement and for this they need good quality food (FAO, 2019).Agriculture sector and its branches like horticulture, fisheries(aquaculture ,marine), dairy farming etc all are good /major sector of food production. The fisheries sector provides almost the 20% of their average per capita intake of animal protein to approx 3billion people(FAO,SOFIA,2020),in which Aquaculture considered for 46% of total fish production which is 82.1million tones and 52%of fish is for human consumption purpose. In various methods/techniques of aquaculture Biofloc is found very eco-friendly and effective as it is easy affordable for farmers which have good water and land sources .Due to need of nutrient quality, cheap protein sources the demand of aquaculture products are increasing day by day .Biofloc culture can be done with zero water exchange under strong aeration and biota formed by Biofloc and productive in case of cultures tanks exposed to sun. As comparison with non Biofloc system, Biofloc system improves the net productivity 8-43% in some species.

BIOFLOC:

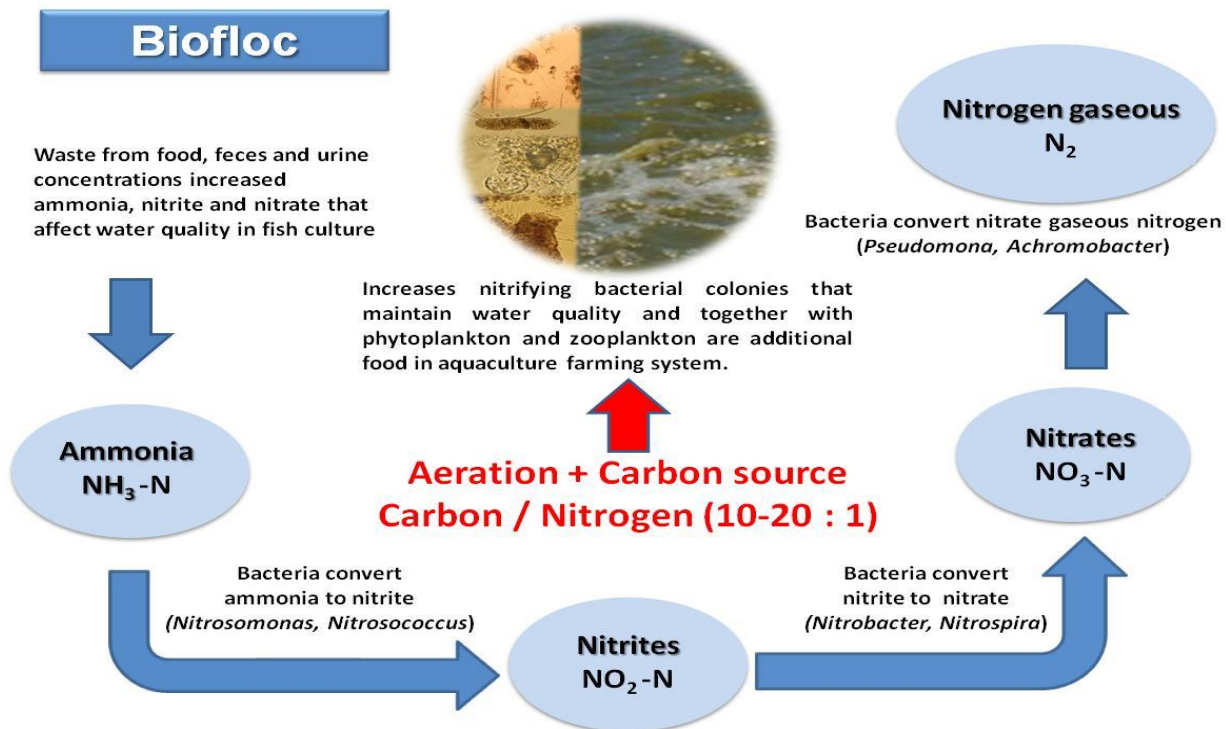
- ✚ This system works on the principle of waste water treatment plant. In this technology toxic materials of fish and shellfish are converted into protein rich feed. The principle of this technology is the generation of N-cycle by maintaining the increased C: N ratio

through simulating microbial growth which assimilates the nitrogenous complex products which are exploited by cultured species as a feed.

- ✚ Firstly microbes are allowed to grow on waste products of organisms and then change into/broken into less organic matter which enters again in food chain after consumed by cultured microorganisms.
- ✚ It is also very cost effective and cheap source of protein (nutritional content) in the market.

Composition and Nutritional value of Biofloc: Biofloc is the heterogeneous flocs of algae, bacteria, protozoan and particles of uneaten feed, feces. Nutritional quality of Biofloc varies but the dry weight protein content ranges from 25-50% and fat content ranges from 0.5-15%. Dried Biofloc also have benefit in aqua feed. Dried Biofloc also replace animal or plant protein sources like fish meals, soya-bean meal that is used in commercial scale aqua-feed manufacturing due to availability of limited quantities. Biofloc also have effect similar to probiotics.

How Biofloc works?



Source: Google (<https://images.app.goo.gl/r4AmwaGfycVBWxSb6>)

The higher C: N ratio is maintained by the addition of molasses which is a carbohydrate source and the water quality is improved by the production of high quality single cell microbial protein, in these situations, dense microorganisms develop and function both as bio-reactor controlling water quality and protein food source. Immobilization of toxic Nitrogen spp. occurs faster in Biofloc due to the growth rate and microbial production per unit substrate of heterotrophs are 10 times greater than the autotrophic nitrifying bacteria. This technique is based upon the principle of flocculation with the system.

Due to bottom dwelling habit and resistance to environmental changes Biofloc technique is used in shrimp farming. Researcher found that 20-30% of shrimp or tilapia growth is derived from the consumption and digestion of microbial protein.

Types of Carbon Sources Used in Biofloc

The carbon sources provided in Biofloc system are mainly the by-products of human and/or animal food industry, preferentially cheap and local available. Cheap and easily available sources of carbohydrates such as molasses, glycerol, and plant meals (i.e., wheat, corn, rice, tapioca, etc.) will be applied before the fry/post larvae stocking. Application of organic fertilizer mainly depending on the carbon source chosen by farmer. Local available sources of organic fertilizer should be tested and bacteria assimilation's characteristics will certainly need to take into account before application of it. Monosaccharide or simple carbohydrate-rich types (e.g., glucose, sucrose-rich sugars, etc.) versus polysaccharide complex-rich types (e.g., starch and cellulose) will lead different bacteria assimilations, nutritional value, and growth in Biofloc system. For each phase of growth of microorganism such as initial and formation phase or maintenance phase, different sources should be chosen according to the price and purpose. For example, the unrefined sugar (monosaccharide) without protein and lipid promoted the best growth and the highest protein content into the tilapia tissue.

Suitable Culture Species

Biofloc systems work best with species that are able to extract some nutritional benefit from the direct consumption of flocs. This system is also most suitable for species that can tolerate high solids concentration in water and are generally tolerant of poor water

quality. Some species having physiological adaptations that allow them to consume Biofloc and digest microbial protein, thereby taking advantage of Biofloc as a food resource, example shrimp and tilapia. All the Biofloc systems are used to grow shrimp, tilapia, or carps. Channel catfish and Hybrid striped bass are examples of fish that cannot easily adopt the environmental condition of this system because they cannot tolerate water with very high solids concentrations.

Advantages of Biofloc technique:

- ✚ It increases the land use efficiency
- ✚ It enhances the water use efficiency
- ✚ It improved the water quality control
- ✚ It reduced the sensitivity to light fluctuations/weather
- ✚ It can improve Biosecurity
- ✚ It can improve feed conversion

Disadvantages of Biofloc technique:

- ✚ It requires the startup period
- ✚ Additional alkalinity supplements are required
- ✚ It reduced the response time because water respiration rates are elevated
- ✚ This system increased energy requirements for mixing and aeration.
- ✚ In-consistent and seasonal performance for sunlight-exposed systems.

Conclusion: Biofloc is the effective environment friendly technique which improves aquaculture production and contributes in development of sustainable developments goals. But still this system is not more in use or in a young stage, requires more research in this technology for its better results. Also there is a need to commercialize this technique at farmer level for up gradation of their knowledge and skills.