Abstract

The biofloc aquaculture system developed at the University of the Virgin Islands is designed for the intensive production of tilapia in a manner that conserves land and water resources. By managing a microbial population of bacteria and algae through mixing and aeration, the system is capable of nearly 30 times the production achieved in a typical pond. Nitrate-nitrogen is the end product of the biological nitrification process on which the system depends. Nitrate-nitrogen is not toxic or detrimental to the growth of tilapia under typical management practices. However, in the biofloc system, water quality analysis has shown that nitrate-nitrogen levels have reached over 700 mg/L and tilapia growth was reduced. The addition of two raceways incorporated anaerobic denitrification as an additional biological process to the system and reduced the accumulation rate of nitrate-nitrogen. Final values of 300 mg/L were achieved.

Further reducing the rate of accumulation and the total amount of nitrate-nitrogen in the biofloc system is the goal of this research. Plants take up nitrate-nitrogen for leafy growth and wetland plants are able to grow in anaerobic soils making them suitable specimens. Wetland plants, native and introduced species, will be planted into the denitrification raceways and allowed to establish in blocked areas. The biofloc system will be operated for a six-month period as a fish production trial with daily management including feeding, aeration, sludge removal and pH adjustment. Water quality and plant tissue will be analyzed periodically throughout the fish production trial. Data analysis will determine the absolute decrease in nitrate-nitrogen over the length of the raceways and the rate of nitrate-nitrogen accumulation in the system over the production period.
After the production trial, the fish will be held in the rearing tank and the system managed as a holding facility. The denitrification raceways will be planted with two species of wetland plant, one species in each raceway. Water quality data analysis will determine the rate of nitrate-nitrogen accumulation and the absolute decrease in nitrate-nitrogen over the length of the raceways. Data on the growth, production and harvest of marketable plant products will be collected and analyzed. An economic analysis of each plant species will be made to determine the best plant for inclusion in the biofloc system.

The research will employ one student worker. A workshop for Virgin Island farmers and the community will disseminate information developed by the research. Additional promotion of the biofloc system and the research will be made at other UVI training and public extension activities and to professional societies.