

Evaluation of Nutrient Removal Efficiency with Chitosan: Nutrient Composition and Bacterial Removal in Effluents of Nile Tilapia (*Oreochromis niloticus*) in the Hatchery

ABSTRACT

Effluents from aquaculture systems contain large volumes of chemical substances and microbial load such as polychlorinated biphenyls and antibiotics that are often used to control infection and pathogenic bacteria originating from feed or water. These substances, if discharged, create pollution in the aquatic environment. Mitigating this problem requires implementing appropriate treatment methods. This study investigated the efficiency of uptake of nutrients in the wastewater and reduction of microbial pollution by chitosan. This product is a linear polysaccharide composed of β -linked D-glucosamine and N-acetyl-D-glucosamine and can be extracted from the shells of shrimps, lobsters, crabs and other crustaceans that are discarded in bulk quantities by seafood restaurants. The performance of laboratory-produced chitosan (S1) which was prepared from shells of Pacific white leg shrimp (*Litopenaeus vannamei*) was compared with that of the commercial grade chitosan (S2). While the latter was more effective in nitrogen and phosphorus removal and reduction of total faecal coliform, the two products were comparable in the uptake of minerals from the effluents from a tilapia culture system. The results showed that S1 and S2 adsorbed the nutrients from aquaculture effluents, especially ammonia (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-) and phosphate (PO_4^{3-}). However, differences were evident in terms of the efficiency of their removal and duration of treatment required for the purpose. In this respect, S2 performed better. Moreover, the anti-bacterial activity of S2 was higher than that of S1, and this appeared to be linked to differences in surface features of the two products. The chitosan extracted from shrimp waste and processed locally provides a low-cost solution to the environmental problems caused by aquaculture effluents.