IMMOBILIZATION OF *Marinactinospora* sp. IN CALCIUM ALGINATE BEAD FOR REMOVING NUTRIENT IN AQUACULTURE WATER

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Effluent from aquaculture is high in dissolved inorganic nitrogen and phosphorus. The effluent should be treated before discharge into the aquatic environment. Biological treatment by using microalgae is widely used to remove nutrient from wastewater. The major drawback of this treatment is the difficulties to regulate and harvest the microalgae from the culture system. Immobilization of microalgae by using calcium alginate is potential to overcome the problem. Immobilization also provides a more stable matrix and better protection to the microbe and enhances nutrient removal. This study aims to improve immobilization of *Nannochloropsis* sp. in calcium alginate for removing excessive nutrient from the aquaculture water. Optimal formulation for immobilizing *Nannochloropsis* sp. in calcium alginate was 5 % (w/v) alginate solution and hardens by 2 % (w/v) $CaCl_2$ solution. Performance of the immobilized cell was boosted by addition of nutrient during the process of immobilization. As compared to the ordinary formulation, growth rate and ammonia uptake of the nutrient-enriched immobilized cell increased by 67.9 % and 42.7 %, respectively. Nutrient in immobilization matrix provided the immobilized

microalgae a pool of nutrient reserve. The immobilized *Nannochloropsis* sp. showed different patterns of nutrient uptake. Orthophosphate uptake by the immobilized cell was a linear reaction while ammonia removal showed an analogous pattern with the Michaelis-Menten model. Reaction constant for orthophosphate uptake was 1.31 x 10^{-5} $bead^{-1}$ hr^{-1} and the half-saturation constant for ammonia uptake was 499 μM N. Maximum ammonia uptake rate by the immobilized cell was 1.41 x 10^{-2} μM N $bead^{-1}$ hr^{-1}. Immobilized *Nannochloropsis* sp. is able to remove nutrient from aquaculture water. The immobilized cell removed 5.79 mg l^{-1} of orthophosphate (100 %), 1.20 mg l^{-1} of total phosphorus (62 %), 4.46 μM of ammonia (100 %), 775.59 μM of nitrite (100 %), 1356 μM of total nitrogen (49 %), and 542 μM of nitrate (28 %) within 96 hours. This immobilization technique offers combined advantages of recycling excessive nutrient and converted them into microalgal biomass. The biomass can be harvested and provided an alternative income to farmers.