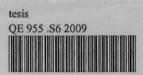


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Perpustakaan Sultanah Nur Zahiran Universiti Malaysia Terengganu (UMT)





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Immobilization of nannochloropsis sp. in calcium alginate bead for removing nutrient in aquaculture water / Soo Chen Lin.

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

SOO CHEN LIN

Thesis Submitted in Fulfillment of the Requirement for the Degree of Master of Science in the Faculty of Agrotechnology and Food Science Universiti Malaysia Terengganu

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

SOO CHEN LIN

March 2009

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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 solution and hardens by 2 % (w/v) CaCl₂ 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 %,

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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^{-3} bead⁻¹ hr⁻¹ and the half-saturation constant for ammonia uptake was 499 μ M N. Maximum ammonia uptake rate by the immobilized cell was $1.41 \times 10^{-2} \mu$ M 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 μ M of ammonia (100 %), 775.59 μ M of nitrite (100 %), 1356 μ M of total nitrogen (49 %), and 542 μ M 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.

berpakansi asak menyelesakan maselah tencant. Penaraman men memberkelesi manika yang lebih stabil dan perkindangan yang lebih baik kepada selerang dipanan dan memperingkankan penyingkina navien. Kasian iki terantuan antak menyingkankan natien yang berlebihan daripada bir alemintana. Pananalan antak menyingkankan natien yang berlebihan daripada bir alemintana. Pananalan antak menyingkankan natien yang berlebihan daripada bir alemintana. Pananalan antak dan ulikeraskan dangan mengganakan daripada bir alemintanan penerapanan alema