

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME II

Editors:

Ibrahim Ali Noorbatcha
Hamzah Mohd. Salleh
Mohamed Elwathig Saeed Mirghani
Raha Ahmad Raus



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Faculty of Engineering
International Islamic University Malaysia**



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CHAPTER 6

A STUDY OF BACTERIAL CELL IMMOBILIZATION IN ALGINATE GEL BEADS FOR THE PRODUCTION OF *MYO*-INOSITOL PHOSPHATES

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ABSTRACT

A novel phytate-degrading enzyme namely PhyFAUIA1 was purified from a bacterium isolated from Malaysian wastewater. It is a periplasmatic enzyme and highly substrate-specific to phytate. The bacterial cells were immobilized in alginate gel beads and its condition for preparation of *myo*-inositol phosphates was investigated. The conditions for immobilized cells were optimized using different media, residence time and temperature. Upon immobilization, beads containing cells were stored in growth medium at 4°C and the yield can be retained for more than 24 hours. The mechanism of reaction between phytate and PhyFAUIA1 using immobilized cells was also investigated and there were 2 possible pathways: (1) PhyFAUIA1 was secreted from the cells and went out from the beads to react with phytate. (2) Phytate diffused through the pores of alginate beads and reacted with phytase located inside the beads as well as at the periplasmic of the cells. P_i and IP were then released from the beads.

Keywords: cell immobilization, alginate, phytate-degrading enzyme, *myo*-inositol phosphates

INTRODUCTION

Phytase, also known as *myo*-inositol hexakisphosphate phosphohydrolase is an enzyme which catalyzes the dephosphorylation of phytate. Phytate is the major storage form of phosphorus in food or feed of plant origin (Reddy et al., 1982). However, phytate is considered to be an anti-nutrient factor since it forms complexes with proteins and metal ions therefore decreases the dietary availability of these nutrients (Reddy et al., 1982; Wodzinski and Ullah, 1996). Phytase has been used in animal feed as an additive to enhance the nutritional quality of plant material for simple-stomached animals by liberating phosphate (Mitchel et al., 1997). Moreover, the addition of phytase has been seen as a way to reduce environmental pollution in areas of intensive animal production since those animals can utilize the liberated phosphates.