CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME II

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CHAPTER 19

EFFECTS OF CELL IMMOBILIZATION TO THE PHYTATE-DEGRADING ENZYME ACTIVITY

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ABSTRACT

The use of immobilized whole microbial cells and/or organelles eliminates the often tedious, time consuming, and expensive steps involved in isolation and purification of intracellular enzymes. It also tends to enhance the stability of the enzyme by retaining its natural catalytic surroundings during immobilization and subsequent continuous operation. A bacterium isolated from Malaysian wastewater producing a novel phytate-degrading enzyme namely PhyFAUIA1 was immobilized in alginate gel beads. PhyFAUIA1 is a periplasmatic enzyme and highly substrate-specific to phytate. The enzyme activity was investigated upon cell immobilization. No shift in pH optima of phytase of immobilized cells was observed. However, the optimum temperature was shifted to 50°C, which was 15°C lower than free PhyFAUIA1 enzyme. Immobilized cells were found to be more stable in wider range of pH and temperature compared to free cells. The results presented in this work show the potential for using immobilized cells to produce different *myo*-inositol phosphates intermediates.

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

INTRODUCTION

Phytate, *myo*-inositol (1,2,3,4,5,6) hexakisphosphate or phytic acid is the major storage form of phosphate in plant seeds and pollen (Konietzny and Greiner, 2002). However, phytate is considered to be an anti-nutrient by binding to protein and by chelating minerals, such as zinc, iron, calcium and magnesium, thereby decreasing the dietary bioavailability of these nutrients (Reddy et al., 1982; Wodzinski and Ullah, 1996). Phytate can be sequentially hydrolyzed by a phytate-degrading enzyme which is known as phytase (*myo*-inositol hexakisphosphate phosphohydrolase, EC 3.1.3.8, EC 3.1.3.26). Phytases can be found in a variety of organisms, including plants, microorganisms and animals (Dvořáková, 1998; Pandey et al., 2001). PhyFAUIA1 has been purified from a bacterium isolated from Malaysian wastewater. The