FINAL REPORT FOR

FUNDAMENTAL STUDIES ON JATROPHA BIODIESEL PRODUCTION USING LIPASE IMMOBILIZED IN HYBRID MATRIX

FGRG0244-TK-1/2010

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ABSTRACT

Immobilization of lipases is gaining importance due to a broad variety of industrial applications they catalyze. In this study, lipase from *Burkholderia cepacia* was first cross linked with glutaraldehyde followed by entrapment into hybrid matrix of alginate and κ - carrageenan polymers. The effect of various parameters like pH, temperature, reusability, enzyme leakage, solvent and storage stability on immobilized lipase were studied. A higher activity yield of 89.26% was observed after immobilization. The immobilized lipase also retained 84.02% of its initial activity following two weeks of storage in T/Ca (Tris-$CaCl_2$)buffer at 4 ^{o} C. Comparative kinetic parameters Km and Vmax values were found to be 0.39 μM and 10 μmol/min for free lipase and 0.45 μM and 9.09 μmol/min for immobilized lipase respectively. A significant enzyme leakage reduction of 65.76% was observed as compared to the enzyme immobilized in hybrid matrix without crosslinking. The immobilized lipase also gave better results for hydrolysis of olive oil. Reduced enzyme leakage, higher thermal stability and better storage stability were the salient features achieved by this method of enzyme immobilization. By this work, an improved entrapment approach of lipase cross linking followed by entrapment onto a hybrid matrix of alginate and κ -carrageenan was studied. This enhanced crosslinked matrix is a step closer in design of a better immobilized lipase for the biofuel industry.

Lipase immobilization has gained immense potential in the biofuel industry mainly to reduce the production costs and to make the method more economical. The first part of

this work was to immobilize cross linked *Burkholderia cepacia* lipase on a hybrid matrix of sodium alginate and κ- carrageenan natural polymers. The second part of this project focused on stability studies of the immobilized lipase. The third and the final part of the work focused on production of biodiesel from *Jatropha curcas* oil using the above hybrid lipase.