Effects of Culture Conditions of Immobilized Recombinant Escherichia coli on Cyclodextrin Glucanotransferase (CGTase) Excretion and Cell Stability

Rohaida Che Man[ab], Ahmad Fauzi Ismail[c], Siti Fatima Zaharah Mohd Fuzi[d], Nazlee Faisal Ghazali[a], Rosli Md Illias[a],

[a] Department of Bioprocess Engineering, Faculty of Chemical Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia

[b] Faculty of Chemical Engineering and Natural Resources, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang, Malaysia

[c] Advanced Membrane Technology Research Center (AMTEC), Universiti Teknologi Malaysia, 81310 Skudai, Johor Bahru, Johor, Malaysia

[d] Technology and Heritage Department, Faculty of Science, Technology and Human Development, Universiti Tun Hussein Onn, 86400 Parit Raja, Batu Pahat, Johor, Malaysia

ABSTRACT

The targeting of recombinant proteins for excretion into culture medium presents significant advantages over cytoplasmic expression. However, during the excretion of recombinant protein, caution must be taken in order to avoid cell lysis due to pressure build-up through overproduction of the expressed recombinant protein in the periplasmic space. In the present study, recombinant Escherichia coli expressing cyclodextrin glucanotransferase (CGTase) was immobilized by adsorption and entrapment in a porous hollow fiber membrane. The effects of culture conditions (post induction time, agitation rate and pH) on CGTase excretion, cell lysis and plasmid stability of immobilized cells were studied. The optimum post induction time, agitation rate and pH were found to be 24 h, 200 rpm and pH 9, respectively. The immobilized cells exhibited a 2.8–4.6-fold increase in CGTase excretion, a 16-95% reduction of cell lysis and a 323-464% increase in plasmid stability compared with free cells. Hence, immobilizing E. coliusing a porous hollow fiber membrane proved to be valuable for the excretion of a recombinant protein and increased cell viability.

KEYWORDS: Immobilized cell; free cell; CGTase excretion; cell lysis; plasmid stability; porous hollow fiber membrane

DOI: 10.1016/j.procbio.2016.01.002