Enhanced excretion of recombinant cyclodextrin glucanotransferase and cell stability of immobilized recombinant *Escherichia coli* by reducing tryptone concentration

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ABSTRACT

BACKGROUND: Recombinant protein excretion has become a mainstream strategy in reducing downstream processing costs. However, recombinant protein excretion is often bottlenecked by cell lysis and plasmid stability. In the present study, recombinant *Escherichia coli* cell immobilization was performed on a hollow fiber membrane. Tryptone concentration in the expression medium (Super Optimal Broth), which was used as a nitrogen source, was varied between 5 and 20 g L^{-1} to enhance the excretion of recombinant cyclodextrin glucanotransferase (CGTase), plasmid stability, and resistance of cell lysis. **RESULTS:** The immobilized cells with 5 g L^{-1} concentration of tryptone improved the plasmid stability with 119% improvement and 69% reduction of cell lysis without remarkably altering the excretion of CGTase compared with the tryptone concentration of 20 g L^{-1}. The immobilized cells showed a 2-fold increase in excretion of CGTase, a 45% reduction in cell lysis, and a 172% gain in plasmid stability in comparison with the free cells. Moreover, the doubling time increased to 58 and 5 h for the immobilized and free cells, respectively. The immobilized cells recorded 2301.62 U mL^{-1} of cumulative CGTase activity through seven fermentation cycles using the untreated membrane, marking their excellent reusability. **CONCLUSION:** This new technique of recombinant protein expression utilizing an immobilized cell system under low tryptone concentration is an outstanding approach to improve recombinant CGTase excretion and plasmid stability with low cell lysis.

KEYWORDS

Cell lysis; CGTase excretion; Cyclodextrin glucanotransferase; Immobilized cells; Plasmid stability; Tryptone concentration

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