Production of a bacterial β-glucanase by expression in *Escherichia coli* and simultaneous adsorption on a metal chelate affinity resin

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ABSTRACT

The production of a chimeric β-glucanase from Bacillus species was studied in an integrated process by expression as well as excretion in E. coli and simultaneous adsorption on a metal chelate resin in shake-flask cultures. In order to establish an effective metal chelate affinity adsorption process, the binding capacity of free PDC-S and Zn^{2+}-PDC (Pentadentate Chelator) as well as its effect on bacterial growth was investigated. The results of integrated batch cultivation revealed that Zn^{2+}-PDC is superior to free PDC, because it was characterized by a higher binding capacity and faster adsorption. The results also showed that the use of Zn^{2+}-PDC resulted in a high -glucanase activity adsorbed on the resin (1697 U ml^{-1}), which is 1.3-fold higher than that obtained in the presence of metal-free PDC (1315 U ml^{-1}). The integrated process in the presence of Zn^{2+}-PDC resulted in a global volumetric activity of β-glucanase of 3590 U ml^{-1}, which was 1.5 and 3.1-fold higher than that obtained with free PDC (2500 U ml^{-1}) and in the absence of PDC (1144 U ml^{-1}), respectively. Moreover, a series of experiments were carried out in order to find out the ideal operating conditions of an integrated process for the production of β-glucanase based on the metal chelate protein purification technique.

Key words: *Escherichia coli, simultaneous fermentation and purification, β-glucanase.*

INTRODUCTION

The production of foreign proteins with the necessary modifications using a selected host is one of the key successes in modern biotechnology. This methodology allows the industrial production of proteins that were otherwise produced in small quantities only. However, the separation and purification of these proteins from the cultivation media constitutes a major bottleneck for the widespread commercialization of recombinant proteins. The major production costs (50-90%) for a