Optimization and scaling up of penicillin acylase production process by escherichia coli

Abstract

In the present study, the standard strain of *Escherichia coli* ATCC 11105 was used to develop an industrial process for penicillin G acylase (PAC) production. Among different media used, media composed of tryptone, yeast extract, sodium chloride and glucose yielded the highest volumetric PAC production of 27.5 U mL⁻¹ after 24 h. Medium optimization studies showed that glucose in concentration not exceeding 4 g L⁻¹ is necessary to support cell growth and volumetric PAC production. Whereas, study of the effect of yeast extract concentration in the production medium exhibits that addition of yeast extract in concentration of 5 g L⁻¹ was necessary also for cell growth and enzyme production. Higher concentrations of glucose or yeast extract decreased both cell growth and PAC production. On the other hand, medium osmolarity played also significant role as important as medium composition. The optimal medium osmolarity for PAC production was 360 mOsmol kg⁻¹. The optimized medium developed in this work not only increased the volumetric enzyme production but also decreased PAC production time from 24 h to only 19 h in shake flask cultures. Further development in the production process was achieved upon transferring the production process to 15-L stirred tank bioreactor. The maximal volumetric PAC obtained in the bioreactor culture was 53.6 U mL⁻¹ after only 10 h cultivations. Moreover, not only the volumetric production increased but also the specific enzyme production (YPIX) was higher by about 50%/0 in bioreactor than those obtained in shake flask under the same cultivation conditions.