Optimization of Feeding Solution Concentration and Feeding Time for Poly(glutamic acid) Production by Bacillus lichenifo

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ABSTRACT

In this study, the optimization of feeding solution concentration and feeding time for poly- γ -glutamic acid (γ -PGA) by Bacillus licheniformis CCRC 12826 was investigated by using two-level factional factorial design. It was found that the optimal volume of the suitable feeding solution comprising 40.0g/L glutamic acid, 42.0g/L citric acid, 158.0g/L glycerol, 1.0g/L NH4Cl, was 25mL and the optimal feeding time was at 20h of cultivation. When 25mL of the suitable feeding solution was added to the originally designed medium at 20h of cultivation, the yield of γ -PGA production was 27.4g/L at 120h of cultivation. It was little less than the yield (28.3g/L) without any feeding solution. When the volume of the feeding solution was reduced from 25mL to 5mL, the component concentrations were calculated to be 200.0g/L glutamic acid, 210.0g/L citric acid, 790.0g/L glycerol, 5.0g/L NH4Cl. When this concentrated feeding solution was fed at the optimal feeding time described above, the yield of γ -PGA production was 31.2g/L at 120h of cultivation. The γ -PGA production was increased by 10.21% from 28.3 to 31.2g/L, while the yield was 37.7g/L after 144h of cultivation and it was increased significantly by 33.25%. With these feeding processes, the culture time for the highest yield of γ -PGA production was delayed. However, this research demonstrated that the feeding processes with the two-level factional factorial design were worth using to improve the yield of γ -PGA production by B. licheniformis CCRC 12826.

Keywords : poly- γ -glutamic acid ; fed-batch ; Bacillus licheniformis

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