Effect of Temperature on the Biosynthesis of PHB by Bacillus megaterium YU-1 under Nitrogen-limiting Fermentation

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ABSTRACT

In this study, Bacillus megaterium YU-1 was cultivated in a batch fermenter under a nitrogen-limiting condition to explore the effect of temperature (26, 30 and 35°C) on microbial growth, PHB production and consumption of nutrition sources. For the case without pH control, the biomass and PHB reached 7.72 and 3.54 g/L, respectively, and PHB/Biomass, 48% at 26°C; the biomass and PHB reached 6.27 and 4.26 g/L, and PHB/Biomass, 68%, at 30°C; the biomass and PHB reached 5.74 and 2.29 g/L, and PHB/Biomass 41% at 35°C. From the above, 30°C seemed to be the best culture condition among the three to produce PHB. For the case with pH control at 5.5, Bacillus megaterium YU-1 was also cultivated in a batch fermenter under various temperatures (26, 30 and 35°C). Experimental results showed that, at 26°C, the biomass and PHB reached 8.31 and 5.59 g/L, respectively, which were the highest among the three temperatures. But the PHB/Biomass ratio ever reached 74%, being the best during cultivation, at 30°C, with a biomass of 6.33 g/L and a PHB of 4.71 g/L. As the temperature was raised to 35°C, the generation time became shorter; however, the biomass and PHB did not continue to accrue. Therefore, a lower temperature seemed to be better for the microbe to produce PHB. In summary, microbial growth and PHB production were better for the case with pH control at 5.5, and 30°C was the best among the three temperatures to produce PHB.

Keywords : polyhydroxyalkanoates ; PHB ; nitrogen-limiting ; batch fermenter

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