Biosynthesis of Poly(hydroxybutyrate) by Bacillus megaterium under Various pHs

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ABSTRACT

Polyhydroxyalkanoates, a kind of biodegradable plastics with physical properties similar to traditional plastics such as polypropylene, can be produced by microorganisms in a scarcity condition of some nutrients. Since the applications of PHAs are quite broad, the research on PHA production has been gaining much attention. In this study, Bacillus megaterium YU-1 was cultivated in a batch fermentor under a nitrogen-limiting condition to explore the effect of pH on microbial growth, PHB production, consumption of nutrients and production of metabolic acids. For the cultivation in the nitrogen-limiting medium under pH 5.5, the biomass and PHB reached 5.03 and 1.23 g/L, respectively, and the ratio of PHB/Biomass, 24.4%, was the highest among various pHs (5.0, 5.5, 6.0 and 7.0). In the nitrogen-limiting cultivation, citric acid was the major metabolic acid with a maximum concentration of 397.8 mg/L at 24 h. In addition, Bacillus megaterium YU-1 was also cultivated in a batch fermentor under a phosphorus-limiting condition to explore the effect of pH on microbial growth, PHB production, consumption of nutrients and production of metabolic acids. For the cultivation in the phosphorus-limiting medium under pH 6.0, the biomass and PHB reached 7.18 and 5.69 g/L, respectively, and the ratio of PHB/Biomass, 79.2%, was the highest among various pHs. In the phosphorus-limiting cultivation, acetic acid was the major metabolic acid with a maximum concentration of 3.1 g/L at 28 h. Experimental results showed that biomass and PHB in the phosphorus-limiting condition were much higher than those in the nitrogen-limiting condition. In the phosphorus-limiting condition, acetic acid was the major metabolic acid, and for the nitrogen-limiting condition the major metabolic acid was citric acid.

Keywords : PHB

Table of Contents

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