利用篩選之菌株Bacillus subtilis DYU1生產聚麩胺酸之研究

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摘 要

Bacillus subtilis DYU1於含有70 g/L L-glutamic acid、30 g/L maltose和5 g/L peptone的培養基中有最大poly-glutamic acid (PGA)產量61 g/L。C/N比會顯著地影響PGA產量及產率。當固定maltose濃度(30 g/L)時，最適C/N比為0.6-7.5；固定peptone濃度(5 g/L)時，最適C/N比為6-10。另外，本研究亦探討其他影響因子，如pH、振盪速度、金屬離子、NaCl和Biotin對PGA生產之影響。另外，nuclear magnetic resonance (NMR) spectrometry的結果證實所純化之產物為PGA。而胺基酸分析結果顯示PGA之純度高達99%。以gel permeation chromatography (GPC)的結果顯示，PGA之分子量超過1,000 kDa；光學異構物分析之結果顯示PGA是以98% D-glutamic acid所組成，證明在B. subtilis DYU1代謝路徑中，可將L-glutamic acid轉化為D-glutamic acid。另外，本研究亦以動力學模式來解析B. subtilis DYU1生長、PGA生長和maltose消耗。Monod和Michaelis-Meten models的結果顯示，當glutamic acid和maltose濃度分別高於70和50 g/L時，有基質抑制PG生產之情形產生。此外，logistic model除了可合理且精確地模擬B. subtilis DYU1生長、PGA生產及maltose消耗之情形，並證實PGA生產行為屬於混合相關模式。另外，本研究探討不同pH值和溫度之PGA溶液流變學行為，亦發展一套與溫度和PGA濃度相關，且對PGA溶液外觀黏度影響之數學模式。本研究亦以活性碳來去除糖蜜廢液之色度，並探討稀釋倍數、吸附劑濃度、pH值和溫度對色度去除之影響。最後，比較處理前後之廢液作為基質來生產PGA之可行性，以達到減廢之效果。

關鍵詞 : Bacillus subtilis ; 聚麩胺酸 ; 動力學模式 ; 流變學特性 ; 糖蜜廢液

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