利用固定化技術生產果糖聚合物之研究

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摘 要

本研究是利用市售納豆菌(Bacillus subtilis natto Takhashi strain)固定化於褐藻膠，並在含蔗糖培養基中進行發酵，同時探討固定化菌體顆粒穩定性和Levan聚果醣產量的變化。固定化菌株系統具有菌株能夠重複使用、增加菌株穩定性與容易從反應混合溶液中分離產物等特性。

褐藻膠固定化菌體顆粒在培養的過程中，固定化菌體之穩定性及Levan之產量會受pH，金屬離子及搖瓶速率所影響。在pH偏微酸性(pH 5.0-6.0)菌體顆粒較穩定，且Levan產量較高。培養基中維持一定金屬離子濃度可維持菌體顆粒的結構，而金屬離子濃度含量過高，則會抑制菌體生長。當轉速在100-175 rpm下，固定化菌體顆粒穩定，且可得到高之Levan產量，在225 rpm之震盪下，菌體顆粒易崩解。固定化納豆菌(Bacillus subtilis natto Takhashi strain)於300ml SM培養基(Sucrose：250 g/L，MgSO4．7H2O：0.5 g/L，NaH2PO4．2H2O：3 g/L，Na2HPO4．12H2O：3 g/L，CaCl2 0.2%，AlCl3．6H2O 0.1%)中培養，可大量生產Levan產物，其培養基最適之pH值5.6-5.8，最適溫度37℃，最適轉速150 rpm。於此條件下培養3天可生產出大量的產物(60-70 g/L)之果聚糖(Levan)。

將菌體顆粒於SM培養基進行重複批次培養時，第二批次培養之後，菌體活性下降，而Levan產量亦隨著降低。若在批次發酵初始將pH值調至5.6-5.8，則可改變Levan產量。若在每批次額外添加10%有機氮源，Levan產量均可達55-70 g/L，證實維持培養基中一定氮源是必要的。在最適培養基與培養條件(Sucrose：250 g/L，MgSO4．7H2O：0.5 g/L，NaH2PO4．2H2O：3 g/L，Na2HPO4．12H2O：3 g/L，CaCl2 0.2%，AlCl3．6H2O 0.1%，10% NB複合培養基)；最適之pH值5.6-5.8，最適溫度37°C，最適轉速100 rpm下培養，固定化菌體顆粒可進行重複批次至少5批次以上，且每批次之Levan產量皆可達到55-70g/L，且菌體仍然保持有高度活性。本實驗室所採用固定化技術之固定化B. subtilis natto菌株顆粒是具有能長期重複培養來生產大量levan產物之優勢。

關鍵詞 : 聚果醣、褐藻膠、固定化

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