

以生物反應槽生產果聚糖之研究

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摘要

本研究是利用市售納豆菌(*Bacillus subtilis* natto Takahashi strain) 以發酵槽進行批次和饋料的培養並探討不同環境因子對levan產量與分子量的影響，進而找出在工業上以發酵槽大量生產levan聚合物的可行性。發酵槽培養微生物有產量可提升、發酵條件控制較容易、培養時間縮短，可節省能源與時間以及菌種來源固定，則品質穩定的優點。Levan為fructofuranosidic殘基以 $\alpha(1\rightarrow6)$ 形式鍵結之果糖聚合物，可以利用微生物來生產，且能夠應用於化妝品、藥品、藥物釋放、農業與食品工業上。不過生產過程中會有其他產物的產生，而造成純化上的困難。因此本研究探討碳源以及各項環境因子影響*B. subtilis* natto在發酵槽中levan的生產。*B. subtilis* natto經過兩次NB培養基(Beef extract: 3 g/L, Peptone: 5 g/L)中活化後，將500mL菌液植入已滅菌以蔗糖為培養基質的5L SM培養基(Sucrose: 250 g/L, MgSO₄ · 7H₂O: 0.5 g/L, NaH₂PO₄ · 2H₂O: 3 g/L, Na₂HPO₄ · 12H₂O: 3 g/L)中，利用2N HCL與2N NaOH將pH值控制在7.0。發酵培養條件為37 轉速175rpm，通氣量5L/min(將空氣當作100%)並且利用pH控制器及DO控制器，線上偵測pH值，至於菌體濃度、各糖類濃度、levan產量，則採離線分析。結果顯示當蔗糖濃度為250 g/L、pH值為7.0、溫度為37、轉速175rpm下，可得最高產量(61g/L在24h時)。另外，本研究在饋料培養當中在24小時時將蔗糖濃度饋回130 g/L時，發現levan的最大產量是有所提高，饋料三次可達最大產量100g/L是優於批次培養的，因此由以上研究可發現發酵槽用來大量生產levan是可行的。

關鍵詞：生物反應槽、*Bacillus subtilis* natto、果糖聚合物

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