發酵槽中利用 Bacillus subtilis DYU1 生產果聚糖之研究

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摘 要

Levan為fructofuranosidic殘基以β-(2→6) 形式鍵結之果糖聚合物，可以利用微生物來生產，且能夠應用在化妝品、藥品、藥物釋放、農業與食品工業上。雖然目前已發表許多關於levan的研究，但其所提到關於levan之產量不是過低，就是在生產過程中會產生其他產物，而不易純化。因此，使得levan之價格較高，而導致levan的應用受到限制。為了更進一步了解利用Bacillus subtilis DYU1來大量生產levan之可能性，本研究探討各項影響B. subtilis DYU1生產levan時的環境因子，並進行產物之純化與鑑定其結構。B. subtilis DYU1於含有20% (w/w) sucrose之培養基中，經過24 h培養後，可生產40-50 g/L的levan聚果醣。經膠體過濾層析法(Gel permeation chromatography, GPC)分析產物levan時，可發現本實驗之產物具有兩種不同之分子量(2 × 107與1 × 104 Da)，且容易利用乙醇沈澱法來進行純化，之後將此產物利用FTIR (Fourier transform infrared)與NMR (Nuclear magnetic reasonance)進行特性分析後，已證實此多醣聚合物即為levan。

利用無菌水清洗後之B. subtilis DYU1菌株以各種氮源基質之條件來進行levan的發酵生產，氮源包括yeast extract、peptone、urea、NH4Cl、NaNO3與玉米漬液。結果顯示B. subtilis DYU1能夠代謝無機氮源 (例如，NH4Cl與NaNO3) 來進行levan生產，但卻無法利用有機氮源(尤其是yeast extract與玉米漬液)。另外，蔗糖濃度也是影響levan產量與levan生產速率(VL)的原因之一。實驗結果顯示levan之合成是需以蔗糖作為碳源，並且將B. subtilis DYU1菌株培養於含有300 g/L蔗糖基質的培養基中，是能得到最大的levan產量(85 g/L)與levan生產速率。並且探討影響levan生產之各項環境因子(例如初始pH與培養溫度)，結果顯示pH 7與溫度為37°C為最適合levan的生產條件。

關鍵詞 : 發酵生產、果聚糖

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