應用微生物串聯式生產果聚糖及生物酒精

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摘 要

本研究主要目的是探討利用蔗糖基質，進行串聯式生產Levan和酒精的可能性。串連過程包括Bacillus subtilis natto在蔗糖基質中生產Levan、利用超過濾濃縮裝置分離Levan與小分子糖類、利用Zymomonas mobilis與小分子糖類生產生物性酒精。生產Levan：在搖瓶生產最佳條件下，以Bacillus subtilis natto在含有250 g/L蔗糖基質中經過48小時培養，可生產60~70 g/L的菌果聚糖（Levan）。將發酵液去除菌體後，經超過濾濃縮裝置可分離成濃縮液與分離液，其中濃縮液含有菌果聚糖（Levan），這是一種非常黏稠之液體，可再添加95%冷凍酒精，可有效率的回收Levan。分離液含有葡萄糖、果糖與未被反應之蔗糖，這些小分子糖類將被利用於酒精發酵實驗中之碳源。 超過濾濃縮裝置：將高、低分子量Levan分離是有必要的，因不同分子量之Levan可應用於各種不同的地方。將Levan發酵液經去菌後之上清液，經由300 kDa分離膜分離後，可得到濃縮液A（再添加95%冷凍酒精，可有效回收高分子量Levan）、分離液A。進一步將分離液A，經由5 kDa分離膜分離後，可得到濃縮液B（再添加95%冷凍酒精，可有效回收低分子量Levan）、分離液B（含有葡萄糖、果糖與未被反應之蔗糖）將被利用於酒精發酵實驗。 生產生物性酒精：分離液中含有約150 g/L之小分子糖類，以Zymomonas mobilis菌株並添加Yeast extract、KH2PO4、(NH4)2SO4、MgSO4．7H2O來發酵生產酒精。其中探討不同發酵條件與環境因子對酒精發酵之影響。結果顯示，以Zymomonas mobilis菌株生產酒精之培養基中，將分離液稀釋50%並添加Yeast extract 1%、KH2PO4 0.1%、(NH4)2SO4 0.1%、MgSO4．7H2O 0.05%，在30℃、在pH 6.5、靜置培養48小時，能得到最高產量31.84 g/L（生產效率（Ey）為93.78%、YP/S為0.49 g/g）的生物性酒精。 利用串聯式發酵過程，是一環境友善之過程，即蔗糖基質可充分利用，而未殘留任何果糖及葡萄糖副產物，同時可生產兩項之物質，其中菌果聚糖（Levan）為一生物可分解性高分子及酒精為一種再生能源。另外過程中使用超濃縮過濾裝置除可分離菌果聚糖（Levan）並可將其濃縮，因此可減少沉澱菌果聚糖（Levan）之有機溶劑使用量，因此為一對環境友善之綠色生產程序。

關鍵詞 : 納豆枯草桿菌、運動發酵單胞菌、超過濾濃縮、菌果聚糖、酒精

目錄

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