以納豆菌生產生物性高分子之研究

游芸悌、施英隆

E-mail: 9314401@mail.dyu.edu.tw

摘 要

本研究探討並發現市售納豆菌(Bacillus subtilis natto Takhashi strain)可於不同培養基中生產不同型態之生物性高分子。 當市售納豆菌(Bacillus subtilis natto Takhashi strain)於100 ml Medium E培養基（Glutamic acid：2%，C3H4(OH)(COOH)3：1.2%，Glycerol：8%，NH4Cl：0.7%，FeCl3‧6H2O：0.004%，MnSO4‧7H2O：0.0104%，CaCl2‧2H2O：0.015%，MgSO4‧7H2O：0.05%，K2HPO4：0.05%）中培養，可生產大量胞外聚合之聚麩胺酸(γ-PGA)產物，其培養基最適之pH值為7.4，最適之溫度為37℃，最適轉速為175 rpm。於此條件下培養6天可生產出大量的產物(1.7 g/100 ml)之聚麩胺酸(γ-PGA)。該產物經由氨基酸分析及H1—NMR分析可確定產物全是聚麩胺酸而無菌果聚醣之產物。 當市售納豆菌(Bacillus subtilis natto Takhashi strain)於100 ml添加蔗糖但未添加麩胺酸之培養基（蔗糖：20%，MgSO4‧7H2O：0.05%，NaH2PO4‧2H2O：0.3%，Na2HPO4‧12H2O：0.3%）中，可生產大量胞外聚合之菌果聚醣產物，其培養基最適之pH值為6，培養基最適之溫度為37℃，最適轉速175 rpm。於此條件培養21 hr可生產出大量的產物(5.06 g/100 ml)之菌果聚醣。該產物經由C13—NMR、H1—NMR及霍氏轉換紅外光譜儀(FTIR)分析，得知其產物僅有菌果聚醣(Levan)而無聚麩胺酸之產生。 當市售納豆菌(Bacillus subtilis natto Takhashi strain)於100 ml添加蔗糖及麩胺酸之培養基（蔗糖：5%，Glutamic acid：1.5%，MgSO4‧7H2O：0.05%，NaH2PO4‧2H2O：0.3%，Na2HPO4‧12H2O：0.3%）中，可生產大量胞外聚合之菌果聚醣及聚麩胺酸之混合物。於pH值7，溫度37℃，轉速175 rpm，條件下培養21 hr可生產出大量的產物(1.2 g/100 ml)之含有菌果聚醣之聚麩胺酸產物。該產物經由氨基酸分析及C13—NMR分析，可得知其產物為含有菌果聚醣及聚麩胺酸之產物。 本實驗亦發現市售納豆菌(Bacillus subtilis natto Takhashi strain)所生產之菌果聚醣之分子量有兩群，一為分子量為1,790,000之產物，另一者分子量為11,000之產物。此二群產物可以逐步添加冷凍酒精之分段沉澱法加以分離。

關鍵詞 : 菌果聚醣 ; 聚麩胺酸 ; 納豆菌 ; 發酵 ; 生物性高分子 ; 搖瓶培養

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