以苔蘚桿菌生產聚麩胺酸之研究

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摘 要

培養基E(麩胺酸20g/L，檸檬酸12g/L，甘油80g/L，NH4Cl 7g/L，MgSO4 7H2O 0.5g/L，FeCl3 6H2O 0.04g/L，K2HPO4 0.5g/L，CaCl2 2H2O 0.15g/L，MnSO4 H2O 0.04g/L)為多株桿菌生產聚麩胺酸之最適培養基。本研究發現苔蘚桿菌(Bacillus licheniformis) CCRC12826在培養基E中可生產聚麩胺酸5.23g/L，此與其他桿菌株於相同培養基所生產之聚麩胺酸產量相差甚距。當探討以其他碳氮源或他們不同組合取代培養基E之碳氮源結果發現麩胺酸、檸檬酸、甘油與氯化銨仍是Baccillus licheniformis CCRC12826生產聚麩胺酸之最佳碳氮源。因此本研究選定麩胺酸，檸檬酸甘油與pH等四個自變因子，並以回應曲面法探討此四因子對Bacillus licheniformis CCRC12826生產聚麩胺酸之影響，經由一階回應區面實驗設計結果，我們發現在培養基中麩胺酸、檸檬酸、甘油對聚麩胺酸產量有顯著的影響性而pH值則無影響性，就單因子對聚麩胺酸的影響以甘油最為顯著(當濃度增加)，其次是麩胺酸及檸檬酸，在因子間之交互影響性對聚麩胺酸產量，以甘油與麩胺酸交互影響最為顯著(當濃度增加)，由一階回應曲面設計法所得之結果，再以一階實驗之中心點(原點)加上實際爬升距離進行陡升路徑實驗。陡升路徑之最高點為檸檬酸17.9g/L、麩胺酸55.4g/L、甘油148.4g/L、因此以此為新原點進行中心混成實驗設計由中心混成實驗之數據進行二階模式的迴歸分析。此一模式對於描述實驗數據之適切程度，可由變異數分析加以檢驗，由Fisher ’ s F檢驗之具有顯著性(p0.05)，皆表示所迴歸得到的二次多項式模式適切甚佳。 本研究先以培養基E探討Bacillus licheniformisCCRC12826生產聚麩胺酸，進而以回應曲面法探討最適產量，從一階回應曲面實驗設計、陡升路經實驗設計到二階回應曲面實驗設計(中心混成實驗設計)，聚麩胺酸產量從5.27g/L(Medium E)增至最終之21g/L(二階)，產量增加了300%，而麩胺酸、檸檬酸、甘油三碳源之最佳培養基為麩胺酸(65g/L)、檸檬酸(22g/L)、甘油(170g/L)；以回應曲面法探討聚麩胺酸生產之最適培養基，確實為有效的方法。

關鍵詞 : 聚麩胺酸 ; 回應曲面法 ; 苔蘚桿菌

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