以反應曲面法探討脂解酵素催化抗壞血酸月桂酸酯之最優化

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摘 要

具有抗氧化能力的抗壞血酸酯類目前已廣泛應用在食品工業、化妝品、和醫療衛生上。目前酯化方式有化學法和酵素法，但基於“ 天然 ”與“ 成本 ”方面的考量，本研究以酵素法生物技術方式來生產天然抗氧化劑。本研究主要採用脂解酵素(Novozyme?435)在有機溶劑中，利用溶劑工程 (solvent engineering)探討不同溶劑組成對直接酯化合成抗壞血酸月桂酸酯的影響，使用三種不同極性的有機溶劑包括正己烷、二甲基二丁醇 (2-methyl-2-butanol; 2M2B)及乙?。利用混合實驗設計配合三角輪廓圖，探討溶劑組成對合成產物之影響，並利用反應曲面法 (Response surface methodology; RSM)及五階層四變數之中心混層實驗設計法 (Central composite rotatable design; CCRD)，分別探討反應時間 (2-10 hr)、反應溫度 (25-65 ?C)、莫耳數比(alcohol:fatty acid=1:1-1:5)及酵素用量 (5-25 mg)等反應變數對合成抗壞血酸酯類之影響，並配合等高線圖 (Contour plots)，以求得反應之最優化合成條件。研究結果顯示，在抗壞血酸月桂酸酯的合成反應中，於反應時間12 hr，反應溫度45 ?C，酵素用量60% (左旋抗壞血酸之重量)，基質比1:2 (左旋抗壞血酸:月桂酸)，溶劑為100%乙?下，可得轉換率86.50%。在抗壞血酸月桂酸酯之最優化合成反應中，於反應時間8 hr，溫度40 ?C，基質莫耳比1.0:4.5及酵素用量20 mg，可得最高轉換率為78.44%。

關鍵詞 : 溶劑工程 ; 抗壞血酸酯類 ; 混合曲面法 ; 反應曲面法

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