以反應曲面法探討羥苯丙酸辛酯之最優化酵素合成

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摘 要

酚酸廣泛地存在於天然植物界中，其不只具有抗氧化活性，還具有抗癌、抗突變、抗過敏及抗衰老等的生物活性。許多天然的酚酸表現出低溶解度以及在各種有機溶劑系統中的低穩定性，故在商業應用上有某部分的限制，如酚酸的親水特性，在油相系統中會減弱其抗氧化活性，因此透過與脂肪醇的酯化作用，改變其溶解度，使其可被應用於以油為基礎的配方和乳化劑中，提升他們在油相系統中的有效性。 酚酸酯類可由化學方法合成，但此等化學方法所合成的酯類並不適合添加於食品中；近年來，經由酵素催化合成酚酸酯類的方法雖已有文獻發表，但受到酚酸立體結構的影響，其酵素反應速率低，致使產率無法提升。故本研究選用立體阻礙較小之對羥苯丙酸 (p-Hydroxyphenylpropionic acid, HPPA) ，於無有機溶劑系統中與辛醇 (Octanol) 合成酚酸酯類，再利用反應曲面法 (Response surface methodology, RSM) 及五階層四變數之中心混層實驗設計，探討酚酸與脂肪醇合成酚酸酯類之酵素合成條件，包括反應時間 (24?72 h) 、反應溫度 (25?65 ?C) 、酵素用量 (10?50%, w/w) 和酵素pH記憶值 (5?9) 對酚酸酯類莫耳轉換率的影響。 研究結果發現，反應時間、反應溫度和酵素用量對酚酸酯類之莫耳轉化率有顯著影響。利用脊形分析可得到酚酸酯類之最優化莫耳轉換率為96%，其反應條件為：反應時間58 h、反應溫度53 ?C、酵素用量38%和酵素pH記憶值7。

關鍵詞 : 酚酸 ; 直接酯化 ; 脂解酵素 ; 最優化 ; 反應曲面法

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