Optimization of Enzymatic Synthesis of Octyl Hydroxyphenylpropionate by Response Surface Methodology

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ABSTRACT
Phenolic acids are widely known as efficient antioxidants in biological systems. Generally, the solubility of natural antioxidants might be a restriction to the practical applications in hydrophobic media. Therefore, the esterification of phenolic acid with alcohol can be a tool to alter physical properties like solubility and activity of the lipophilic antioxidants in oil based formulae and emulsions.

Phenols can be converted into esters by esterification with acid chlorides or acid anhydrides; however, these routes do not meet the requirements necessary for food applications. Recently, the esterification of organic acids via enzymatic routes has been successfully reported in some studies. The ability for immobilized lipase Candida antarctica (Novozyme®435) to catalyze the direct esterification of p-hydroxyphenylpropionic acid and octanol was investigated in this study. Response surface methodology (RSM) and 5-level-4-factor central composite rotatable design (CCRD) were employed to evaluate the effects of synthesis parameters, such as reaction time (24–72 h), temperature (25–65 °C), enzyme amount (10–50%, w/w), and pH memory (pH 5–9) on percentage molar conversion of phenolic acid ester. Reaction time, temperature and enzyme amount were the most important variables. Based on ridge max analysis, the optimum synthesis conditions with 96% molar conversion were: reaction time 58 h, temperature 53 °C, enzyme amount 38%, and pH memory 7.

Keywords: phenolic; direct esterification; lipase; optimization; response surface methodology

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