Optimization of Enzymatic Synthesis l-Menthyl Butyrate by Response Surface Methodology

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ABSTRACT

Abstract l-Menthol is widely used in food, flavor, medical, and cosmetic in the industry. Its activity mainly depends on its pure optical type. The yearly demand of menthol is about twelve thousand tons in the world. l-Menthyl acetate, a colorless liquid with fresh fruity peppermint odor, is prepared by esterification of l-menthol with acetic anhydride. It is able to reder peppermint fragrance in nonaqueous systems. At present, l-menthyl ester is mainly prepared through chemical reaction; however, its productivity step is inextricable, time- consuming, and more dangerous. Therefore, the major purpose of this study is to catalyze directed esterification of l-menthol and butyric anhydride in anhydrous organic solvent by the stereoselectivity of Candida rugosa lipase (Lipase AY-30). Response surface methodology (RSM) and five-level- four- factor central composite rotatable design (CCRD) were adopted to evaluate the effects of synthesis variables, such as reaction time (2 – 10 hr), temperature (25 – 65 ? ° C), substrate molar ratio (l-menthol:butyric anhydride=1:1 – 1:3), and enzyme amount (10 – 50%), on percentage molar conversion of l-menthyl butyrate; to find the optimum conditions of l-menthyl butyrate by contour plots analysis. The results showed that reaction time, temperature and enzyme amount have marked effect for molar conversion of l-menthyl ester. The optimum conditions of l-menthyl butyrate synthesis was:reaction time 8.7 hr, temperature 37.1 ? ° C, substrate molar ratio 1.0:2.6 (l-menthol : butyric anhydride), 31.7% enzyme amount, and the highest yield was 72.6%.

Keywords : l-Menthyl ester, Lipase, Response Surface Methodology, Optimization

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