Abstract

The optimization of process variables for the production of fatty acids from lipase catalyzed hydrolysis of oil is investigated in presence of surfactants. In this work, non-regioselective hydrolysis of castor oil to ricinoleic acid and regioselective hydrolysis of oriental mustard oil to erucic acid are considered.

In lipase catalyzed hydrolysis of castor oil, enzyme concentration and buffer concentration are found to be highly significant by response surface methodology. Small change in temperature causes considerable change in ricinoleic acid production but pH has no significant effect. A nonionic surfactant Span 80 increases production of ricinoleic acid significantly due to formation of water in oil emulsion at quite low buffer concentration. In presence of surfactant, temperature, surfactant concentration and speed of agitation are insignificant whereas enzyme concentration, buffer concentration and pH are highly significant variables. Mutual interactions between any two of the three significant variables are also found to be significant.

In lipase catalyzed hydrolysis of oriental mustard oil, pH, temperature and buffer concentration have important impact on hydrolysis according to response surface methodology. Enzyme concentration remains insignificant. The only important mutual interaction is that between temperature and buffer concentration. At a quite low buffer concentration, a combination of nonionic surfactants (Tween 80 and Span 80) further enhances erucic acid production. In mixed surfactant system, enzyme concentration and concentration of Tween 80 are significant variables. In particular, Tween 80 has greater impact on erucic acid production than Span 80. But, temperature and speed of agitation remain insignificant. The most significant interaction is pH-enzyme concentration interaction. Besides, interactions of concentration of Span 80 with both enzyme concentration and concentration of Tween 80 are also significant.

Hydrolysis of castor oil as well as mustard oil is found to obey a first order rate equation with respect to substrate concentration. The apparent rate constant for castor oil hydrolysis increases in presence of Span 80. Similarly, the apparent rate constant in mustard oil hydrolysis also increases in presence of mixed surfactants.

Keywords: Hydrolysis, *Candida rugosa* lipase, Porcine pancreas lipase, Castor oil, Mustard oil, Response surface methodology, Span 80, Tween 80.