

Statistical optimization of process parameters for lipase-catalyzed synthesis of triethanolamine-based esterquats using response surface methodology in 2-liter bioreactor

ABSTRACT

Lipase-catalyzed production of triethanolamine-based esterquat by esterification of oleic acid (OA) with triethanolamine (TEA) in n-hexane was performed in 2 L stirred-tank reactor. A set of experiments was designed by central composite design to process modeling and statistically evaluate the findings. Five independent process variables, including enzyme amount, reaction time, reaction temperature, substrates molar ratio of OA to TEA, and agitation speed, were studied under the given conditions designed by Design Expert software. Experimental data were examined for normality test before data processing stage and skewness and kurtosis indices were determined. The mathematical model developed was found to be adequate and statistically accurate to predict the optimum conversion of product. Response surface methodology with central composite design gave the best performance in this study, and the methodology as a whole has been proven to be adequate for the design and optimization of the enzymatic process.

Keyword: Optimization; Triacylglycerol lipase; Bioreactor.