

Synthesis of conjugated linoleic acid-rich triacylglycerols by immobilized mutant lipase with excellent capability and recyclability

ABSTRACT

Conjugated linoleic acid (CLA)-rich triacylglycerols (TAG) have received significant attention owing to their health promoting properties. In this study, CLA-rich TAG were successfully synthesized by an immobilized mutant lipase (MAS1-H108A)-catalyzed esterification of CLA-rich fatty acids and glycerol under vacuum. MAS1-H108A was first immobilized onto ECR1030 resin. Results showed that the lipase/support ratio of 41 mg/g was suitable for the immobilization and the thermostability of immobilized MAS1-H108A was greatly enhanced. Subsequently, the immobilized MAS1-H108A was employed for the synthesis of CLA-rich TAG and 95.21% TAG with 69.19% CLA was obtained under the optimized conditions. The TAG content (95.21%) obtained by immobilized MAS1-H108A is the reported highest value thus far, which was significantly higher than that (9.26%) obtained by Novozym 435 under the same conditions. Although the TAG content comparable to the results obtained in this study could also be obtained by Novozym 435, the used enzyme amount is approximately 5-fold of the immobilized MAS1-H108A. Additionally, the immobilized MAS1-H108A exhibited excellent recyclability during esterification retaining 95.11% of its initial activity after 10 batches. Overall, such immobilized mutant lipase with superior esterification activity and recyclability has the potential to be used in oils and fats industry.

Keyword: Conjugated linoleic acid; Triacylglycerols; Immobilization; Esterification; Recyclability