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Research Article

PERACYLATING ACTIVITY OF FREE AND MOBILIZED LIPASES OF THE FUNGUS RH.MICROSPORUS

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ABSTRACT

Recently, in the highly developed countries of the world, there has been a significant expansion in the production and use of enzyme preparations. The industrial development of new enzymatic technologies in combination with traditional ones has several advantages: lower production costs, environmental safety of production, obtaining products for various purposes, and the use of raw materials of any quality and type. Enzymatic processes using raw materials of various origins are very promising for all branches of the food and processing industry.

KEYWORDS

Rh.microsporus, Lipozyme RM IM, Enzymatic processes, hydrophobic sorbent.

INTRODUCTION

To date, progress in the study of lipases, especially lipases of microbial origin, is quite significant - many of them have been isolated in a homogeneous state and characterized, for many of them the amino acid sequence and other structural elements have been determined [4-7].

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THE MAIN PART

Lipolytic enzymes are used to produce lipids with certain structural characteristics. For example, in [1], sunflower oil was enzymatically acylated with mixtures of palmitic and stearic acids in a bioreactor with immobilized Lipozyme RM IM lipases. At a molar ratio of fatty acid : sunflower oil (6:1), the incorporation rate was 8% with immobilized Lipozyme RM IM lipase. It has been shown that the optimal conditions for carrying out the acylation process are: a temperature of 50-60 °C and an incubation time of 24-48 hours.

Similar work was carried out with blackcurrant oil using lipases. Lipozyme IM specific to the 1,3 positions of fatty acids [2]. The acylation reaction was carried out in the ratio of fatty acid 1:5 at a temperature of 60 °C in an isooctane medium. The degree of incorporation of capric acid into blackcurrant oil was 42.16% after 15 hours of reaction.

The purpose of this work is to study the transacylating activity of free and immobilized lipases of the fungusRh.microsporus. Cottonseed oil, eicosapentaenoic acid and its ethyl ester were used as a substrate. A hydrophobic sorbent based on silica gel, polyamide, and cephalin (phosphatidylethanolamine) was used as a sorbent for enzyme immobilization [3]. Glutaric dialdehyde was used as a crosslinking agent.

The table shows the results of using immobilized lipases in specific processes (acylation and re-acylation of cottonseed oil and eicosapentaenoic acid) to obtain products enriched in polyene fatty acids [6-10].

To carry out the transacylation reaction, an equal amount (1:1, by weight) of a fatty acid fraction containing 95% eicosapentaenoic acid is added to the starting materials.

From the presented data, it can be seen that in all cases the process of incorporation of eicosapentaenoic acid into the composition of cottonseed oil proceeds more intensively and the degree of incorporation depends on the state of the enzyme and fatty acid.

In the case of using free fatty acid, the degree of incorporation with free lipase was 4±0.3%. With immobilized lipase, this figure was 8±0.3%. The transacylation reaction proceeds at a much faster rate when the fatty acid is used in the form of an ethyl ester. For example, lipase immobilized on hydrophobic sorbents exhibits high transacid activity and the degree of fatty acid incorporation is 20 ± 0.4%.

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Table 1. Enzymatic incorporation of eicosapentaenoic acid into cottonseed oil with free and immobilized fungal lipasesRh.microsporus

Enzyme state	*The inclusion of eicosapentaenoic acid in the composition of cottonseed oil, in%.*	
	Cottonseed oil + eicosapentaenoic acid	Cottonseed oil + eicosapentaenoic acid ethyl esters
Free lipase	4±0.2	6±0.3
Immobilized lipase	8±0.3	20±0.4

CONCLUSION

Thus, the immobilized enzymes used by us have a high transacylating activity and they can be used to obtain leads with the required physicochemical parameters.

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