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Cecilia Guerrero, Carlos Vera, Andrés Illanes

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Fed-batch operation for the synthesis of lactulose with β -galactosidase of *Aspergillus oryzae*.

Cecilia Guerrero¹, Carlos Vera², Andrés Illanes^{1*}.

1. School of Biochemical Engineering, Pontificia Universidad Católica de Valparaíso (PUCV), Valparaíso, Chile.

2. Department of Biology, Faculty of Chemistry and Biology, Universidad de Santiago de Chile (USACH), Santiago, Chile.

*: corresponding author. Tel. 56 32- 2272035; E-mail address: aillanes@pucv.cl

Abstract

Fed-batch synthesis of lactulose from lactose and fructose with *Aspergillus oryzae* β -galactosidase was evaluated, obtaining a concentration of 40.4 g·L⁻¹, which is 20 % higher than obtained in batch, while the concentration of transgalactosylated oligosaccharides (TOS) was reduced by 98%. Therefore, selectivity of lactulose synthesis can be significantly higher by operating in fed-batch mode. The enzyme-limiting substrate mass ratio (E/S) is a critical variable in fed-batch operation. Higher values favor lactose hydrolysis over transgalactosylation, being 400 IU/g the limit for proper lactulose synthesis in fed-batch operation. Selectivity of lactulose synthesis increased with E/S being quite high at 800 IU_H·g⁻¹ or higher. However, this increase was obtained at the expense of lactulose yield. Lactulose synthesis in fed-batch operation was a better option than conventional batch synthesis, since higher product concentration and selectivity of lactulose over TOS synthesis were obtained.

Keywords: β -galactosidase, lactulose, fed-batch operation, batch operation, *Aspergillus oryzae*.

1. Introduction

Dairy industry has been revitalized in recent decades by the introduction of functional food products (Casiraghi et al., 2007). Within this scenario, non-digestible oligosaccharides have gained importance by selectively stimulating the activity and/or growth of healthy bacteria within the colon microbiota and providing immunity against some pathogenic species (Gibson & Roberfroid, 1995; Huebner et al., 2007). Among them, lactulose stands out for

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