

Fermentative Lactic Acid from Deproteinized Whey Using *Lactobacillus bulgaricus* in Batch Culture

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Abstract: Lactic acid is an organic acid which has a wide range of application in food, pharmaceutical, leather and textile industries. Lactic acid is produced via chemical synthesis and also fermentative processes. In microbial fermentation, lactic acid is produced by lactic acid bacteria. The aim of present research was to investigate the effect of lactose concentration in production of lactic acid from cheese whey using *Lactobacillus bulgaricus* (ATCC 8001, PTCC 1332) in a batch culture. Fermentation media was inoculated, stirred at 180 rpm and incubated at 32°C. Substrate consumption and lactic acid production were determined. Four defined lactose concentrations were used in fermentative lactic acid production. Maximum lactic acid production of 24.57 g.lg⁻¹ was achieved with initial lactose concentration of 40 g.lg⁻¹. As the concentrations of lactose in the fermentation media was reduced from 40 to 10 g.lg⁻¹, the yield of lactic acid production from 0.69 to 0.81 g lactic acid per g lactose was improved.

Key words: Lactose % Lactic acid % Whey % Fermentation % *Lactobacillus bulgaricus*

INTRODUCTION

Lactic acid ("hydroxy propionic acid) (C₃H₆O₃) [1] is a natural organic acid which has number of applications in pharmaceutical, food and chemical industries as an acidulant, preservative and substrate for the production of some other organic acids [2]. Nowadays, production of lactic acid has increased due to demand for its use as a raw material for biodegradable polymers (PLA) and renewable plastics [3, 4]. Lactic acid manufactured by chemical synthesis or microbial fermentation. In recent years, the amount of lactic acid obtained via biotechnological methods has significantly increased [5, 6]. There are two optical isomers of lactic acid; L (+) lactic acid, D (-) lactic acid and racemic (DL) lactic acid. D (-) lactic acid is harmful to human metabolism [5]. Microbial fermentation lead to optically pure isomers L(+) or D(-) lactic acid from renewable sources, while chemical synthesis always produces racemic (DL) lactic acid from petrochemical resources [1, 6].

Approximately 90% of lactic acid was produced by lactic acid bacteria (LAB) via fermentation of carbohydrates. The genus *Lactobacillus* belongs to a large group of LAB which is gram-positive and safe organisms. The genus *Lactobacillus* is a heterogeneous group of lactic acid bacteria with important implications in food fermentation [7]. *Lactobacilli* have been used for decades in food preservation as starters for dairy products, fermented vegetables, fish and etc.

Fermentation comes from a variety of sugar known as substrates. Several carbohydrate substances such as corn and potato starch, molasses and whey are used for lactic acid production [1]. Hydrolyzed sugars from starch and molasses are abundant substrate for industrial use. The choice of substrate depends upon its availability, treatment required prior to fermentation and processing costs. Pure sugar is the best substrate for lactic acid production but the process for purification of sugar is most probably an expensive process. Therefore, reasonably

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