LACTIC ACID PRODUCTION FROM MOLASSES UTILIZING LACTOBACILLUS DELBRUECKII AND INVERTASE TOGETHER

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Molasses was used as a substrate in the production of lactic acid and the production yield by Lactobacillus delbrueckii was found to be only 46%. However, if the required suitable nutrients for microorganisms such as yeast extract, diaminonucleotide, magnesium sulphate were added to the culture media, the yield was increased up to 70%. In order to increase the production rate and the yield, sucrose was converted into its monosaccharides by employing technical invertase of 44 i.u/mg enzyme activity. In this case, the yield was determined as 83%.

INTRODUCTION

Lactic acid can be produced from glucose, sucrose, cereals and agricultural wastes, all of which are reducible to monosaccharides, by lactic acid bacteria Lactobacillus delbrueckii through fermentation (1). Molasses is a convenient raw material for lactic acid fermentation since it contains a high concentration of sucrose, it is cheap and abundant, it requires a little handling before fermentation and can be used for production of raw or technical grade lactic acid (2). Before fermentation, the molasses must be diluted to under 20% (w) of sucrose, the pH must be adjusted to 6.2 with H2SO4, and suitable nutrients for microorganisms must be added (2,3).

Molasses production of Turkey in 1984 was approximately 1.0 million tons. A major part of this was used in the production of ethyl alcohol and animal foods. The remaining molasses was exported at low price. On the other hand Turkey’s lactic acid and calcium lactate requirement were 10,000 tons per year.
Thus lactic acid production from molasses seems to be an attractive alternative to exporting.

**MATERIALS AND METHODS**

**Microorganism and Culture Medium:**

*Lactobacillus delbrueckii*, NRLL B445 was grown on a medium of 20 g/l main substrate (glucose, sucrose, etc.), 10 g/l yeast extract, 5 g/l peptone and some inorganic salts such as Mg²⁺, Na⁺, SO₄⁻, PO₄⁻. The pH was fixed at 6.2 with dilute H₂SO₄ and temperature was maintained at 42°C. Microaerophilic conditions was provided by the continuous flow of CO₂. *L. Delbrueckii* was propagated on petri dishes and tubes containing 20.0 g/l agar and liquid medium. The media liquid or solid was sterilized by an autoclave.

**Enzyme:**

In order to convert molasses' sucrose into monosaccharides, technical invertase of 44 i.u/mg enzyme activity was employed. Optimal conditions for invertase activity were 55°C and pH=4.5.

**Experimental Set-up:**

Production of lactic acid was investigated in a batch stirred tank reactor, comprising a one liter fermentor equipped with speed, pH and temperature controls.

**Estimation of Glucose, Lactic Acid and Dry Weight:**

Glucose was determined enzymatically with glucose oxidase-peroxidase method developed by Boehrings of Germany(4). Lactic acid was measured by titration with NaOH using brome thymol blue as the indicator. Dry weight of microorganisms were determined by measuring the turbidity with a spectrophotometer at a wavelength of 480 nm.