UNIVERSITI TEKNOLOGI MARA

MODELLING OF *LACTOBACILLUS PLANTARUM* GROWTH IN A CHEMOSTAT FERMENTATION SYSTEM

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ABSTRACT

Nowadays, biotechnology application is a well-known method in the food manufacturing, especially in lactic acid fermentation processes. When the demand for lactic acid production increases, the biomass production of lactic acid also needs to be increased. Since *Lactobacillus plantarum* is homofermentative on glucose, lactic acid is the main product formed. Modelling and simulation were used to simulate the kinetic behaviour of *Lactobacillus plantarum* in Chemostat fermentation using MATLAB® software. Monod model was introduced to develop the suitable equations of mass balance for Chemostat fermentation. By doing this simulation, biomass concentration, substrate utilisation and dilution rate of *L. plantarum* were predicted. In conclusion, dilution rate and substrate concentration were identified as a factor that influences the performance of *Lactobacillus plantarum* in Chemostat mode.

CHAPTER ONE

INTRODUCTION

1.1   Background of study

In the developing countries nowadays, biotechnology application is one of the well-known methods that is commonly used for the development and improvement of food production especially by fermentation processes. This technology is widely applied in large scale production especially in industrial manufacture. In most of the previous study of biotechnological application regarding the fermentation process, they target the use of microorganism which is bacteria or fungi for improving compounds production that finds application in the many sectors such as in chemical, material, pharmaceutical and the food manufacture. When the demand of production for these industrial fields increases, the biomass production of microorganisms also needs to be increased. Thus, the production cost of biotechnological production will be increased. This study was designed to model the chemostat system of Lactobacillus plantarum to minimise the substrate consumption as well as volume and also maximise the production of its biomass.

1.2   Significance of study

The estimated model that obtained from this study is used as a reference to compare with the measured value from experimental data. This knowledge will result in significant impact on wide-scale production of *L. plantarum.*