EFFECT OF SUPPLEMENT AND DILUTION ON MICROALGAE BIOMASS GROWTH IN POME FROM EFFLUENT OF BIOGAS PLANT OF FELDA SG TENGI PALM OIL MILL

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ABSTRACT

The purpose of this research is to investigate the effect of supplement and dilution of POME from biogas plant of Felda Sg Tengi Palm Oil Mill on the growth of microalgae species, *Chlorella sorokiniana*. The research is done by studying the main effect and interactive effect of four variables controlling the process on the maximum biomass concentration and maximum specific growth rate of microalgae in a batch fermentation. Linear regression was then used to determine the relationship between the variables and the objective function of maximum biomass concentration, and the objective function maximum specific growth rate. Four variables were introduced for 2^4 factorial experiment, namely carbon dioxide (CO_2) concentration, gas mixture sparging rate, supplement concentration and dilution level. The data obtained from the experiment were fitted into logistic equation by using MATLAB R2013a software to get the value of both maximum specific growth rate and maximum biomass concentration. Then the main effect of each variable and the Interactive Effects between variables on the objective function maximum biomass concentration and maximum specific growth rate were evaluated by using Yate's Method. The results showed that the main effect of each variable is positive on both maximum biomass concentration and maximum specific growth rate. By increasing each of the variables from low level to high level will increase the biomass concentration. From regression evaluation, it showed that CO_2 concentration has a very critical effect on biomass growth and on maximum specific growth rate, followed by gas mixture sparging rate, supplement concentration and dilution level. In conclusion, the study of CO_2 sequestration by microalgae and the effect of supplement and dilution in POME on both maximum biomass concentration and maximum specific growth rate can be determined by this method.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Palm oil industry is one of the leading agricultural commodities and the oldest industries exploited in Malaysia. The uniqueness of oil palm tree in the palm oil production is that the palm oil is not only obtained from fresh fruit bunch (FFB) but also located in its kernel. Due to this, there are many kind of fields with wide range of products involved in palm oil industry. Despite of different kind of oils produced in the industry, the number of palm oil production increase significantly due to high in demands each year, either the global demand or the local demand. Due to high amount of production produced, the amount of waste had generated uncontrollably.

Palm Oil Mill Effluent (POME) is the wastewater discharged from the sterilization process, crude oil clarification process and cracked mixture separation process, which requires effective treatment before discharge into the nearby water bodies due to its highly polluting properties. It is classified a high strength wastewater due to its composition, which characterized with both high value of Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) respectively, as well as consisted huge amount of Total Suspended Solid (TSS) along with significant amount of oil and grease and other constituents.