

UNIVERSITI TEKNOLOGI MARA

**OPTIMISATION OF MEDIUM FOR
MICROALGAE GROWTH BASED ON
FACULTATIVE POND 6 OF SIME DARBY SUA
BETONG PALM OIL**

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ABSTRACT

This research study is about the optimisation of medium for microalgae growth based on facultative pond 6 POME of Sime Darby Sua Betong Palm Oil Mill. The idea is to treat Palm Oil Mill Effluent (POME) and sequester carbon dioxide (CO_2) that are released from the conversion of methane gas (CH_4) to CO_2 . A strain of *Chlorella* sp. was used to treat POME and sequester CO_2 gas simultaneously. Six times diluted POME from facultative pond 6 was subjected to different CO_2 concentrations in the sparging gas mixture (x_1) and to different gas mixture sparging rates (x_2), to determine their optimum level of dissolved CO_2 concentration, x_1 and the level of sparging rate, x_2 that gives a maximum biomass concentration and (X_m) and the maximum specific growth rate (μ_m) of microalgae in batch growth by using a Response Surface Method (RSM). The data obtained from the factorial experiments were fitted in logistic equation by using MATLAB R2014a software before performing Linear Regressions. Since the Linear Regression satisfies the requirement of containing the maximum in both cases, the 2^2 factorial experiments were complemented with the necessary points to make the Composite Design. The optimisation of microalgae growth was done using a Quadratic Equation to obtain the maximum point of the variables. From the result obtained, it was found that at sparging rate of 0.900 vvm and at CO_2 concentration of 16%, the maximum specific growth rate is predicted to be 4.17 h^{-1} .

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CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

Palm oil mill is one of the biggest industry in the world. Nowadays, it has become an important product in the world and Malaysia is now has become the second larger producer of Crude Palm Oil (CPO) in the world which has contributes 10.3% of oil and fat production. Besides, it also can produces more than 13 million tonnes per year of CPO and the oil palm plantation includes 11% of land area of Malaysia (A. Ahmad, Buang, and Bhat 2016). Currently, palm oil is used as a source to produce biodiesel. From the latest Star Online News, B10 has become an attractive alternatives in various applications especially for the uses of vehicles that are considered safe towards the environment. Thus, this will give big impacts on CPO production and is expected to increase the usage in Malaysia (News 2016). In palm oil production, the harvested parts are usually a Fresh Fruit Bunches (FFB). The uniqueness of this palm oil is that it can be processed into two types of oil which are Palm Kernel Oil (PKO) that are obtained from the white flesh and CPO from the mesocarp.

However, large production of palm oil can caused serious pollutants towards the environments. Palm Oil Mill Effluent (POME) is an effluent water that are discharged from palm oil mill production whereby the sterilization of FFB, clarification of palm oil and effluent from hydrocyclone operations took places (A. Ahmad, Buang, and Bhat 2016). This wastewater is untreated and contains very high concentration of waste that includes various liquids, dirties, residual oil and suspended solids. Moreover, it also contains high amounts of Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD) which can caused serious pollution to the environment especially water sources. In Malaysia, the discharge limits for POME to be discharge into water sources and their typical characteristics has been assigned by Malaysian Palm Oil Board (Lam and Lee 2011). However, the failure of certain palm oil mill factories to fulfil the