

CULTIVATION OF *Chlorella vulgaris* USING DIFFERENT SOURCES OF CARBON AND ITS IMPACT ON LIPID PRODUCTION

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ABSTRACT

A cultivation process of *Chlorella vulgaris* has been done in different treatment to investigate the optimum condition for lipid production. Firstly, autotroph and heterotroph condition have been applied to test the significance impact of carbon availability to the growth and lipid production of *Chlorella vulgaris*. And for the same purpose, heterotroph condition using glucose, fructose and sucrose as carbon sources was independently implemented. The growth rate of *Chlorella vulgaris* in autotroph condition was much slower than those in heterotroph. The different sources of carbon gave no significant different in the growth pattern, but in term of lipid production it was presented a considerable result. At lower concentration (3 and 6 gr/L) of carbon sources there was only slight different in lipid production level. At higher concentration (12 gr/L) glucose as a carbon source produced the highest result, 60.18% (w/w) compared to fructose and sucrose that produced 27.34% (w/w) and 18.19% (w/w) respectively.

Keywords : *Chlorella vulgaris*, fructose, glucose, lipid, sucrose

1. INTRODUCTION

A rapid growth rate of world population since the era of industrial revolution has resulted in serious problems on the human life condition. United Nations (UN) has announced Sustainable Development Goals (SDGs), in which 17 issues reflecting those problems are elaborated in detail. Energy is an essential need to support daily activities and industrial sector, the demand on energy is now much higher in parallel with global population number. Nowadays, supply to fulfill energy demand is still relying on non-renewable energy sources. Unfortunately, the continual usage of fossil fuels (e.g. oil, coal) produces side products that negatively affect the quality of environment. Several environmental problems such as ozone depletion, climate change, acid rain and local air pollution are exist because of gasses from the combustion process of fossil fuels (Khan et al, 2009). Moreover dependency on fossil fuels will create economic problem since these are considered finite materials. The stock of fossil fuels is gradually decreasing and it will significantly increase the price. To anticipate that condition, UN has declared in SDGs that by 2030 the share of renewable energy in the global energy mix should increase substantially. Thus the introduction of alternative energy needs to be fostered. Microalgae is a potential natural resource for substituting fossil fuel because of its high lipids content. Several researches reported that biomass of microalgae is a promising material to fulfill the global energy demand especially in the transportation sector (Christi 2009, Demirbas and Ayhan 2010). Comparing the efficiency in oil production,