Watchara Jantasee 2014: Improvement of Lipid Production by Mutation *Chlorella* sp Master of Science (Microbiology), Major Field: Microbiology, Department of Microbiology. Thesis Advisor: Duenrut Chonudomkul, Ph D. 105 pages.

Identification of *Chlorella* sp. DMKU5201 and DMKU5202 by using partial 18S rDNA sequences revealed that they were closely related to *Chlorella sorokiniana* with similarity of 99 – 100%. Improvement of lipid contents of these two microalgae were carried by UV mutation for starchless mutants. The selected strain was then optimized by statistical experimental designs for growth and lipid production. Approximately 40,000 UV treated colonies were screened by iodine impregnation technique. Sixty-three colonies appeared to be starchless mutants. Secondary screening of the mutants showed that 8 of them starchless accumulated higher oil content than the wild type strains and the mutant *C. sorokiniana* DMKU 5202-31 had the highest biomass, lipid production and lipid content 0.30 g/L, 0.063 g/L and 21.16%, respectively. Optimization of *C. sorokiniana* DMKU 5202-31 was done by Plackett-Burman Design (PBD) and Central Composite Design (CCD) to determine the significant factors affecting biomass production and lipid accumulations. Finally, three factors namely KNO_3, pH and Light intensity were chosen from PBD analysis. CCD was used to optimize the three selected factors. The response surface plots were observed for the maximum biomass, lipid production and lipid content. Their optimal values were determined as follows 0.9 g/L of KNO_3, pH 6.2 and 4,000 lux of light intensity which yielded biomass at 2.58 g/L, lipid production of 1.40 g/L and lipid content 54.49%. It could be concluded that optimization of medium composition and culture conditions could improve oil production of the starchless mutant *C. sorokiniana* DMKU5202-31 which had the potential for biodiesel production.

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