# Study on Volatile Fatty Acids as a Sole Carbon Source on Lipid Accumulation byMixotrophic Microalgae


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### ABSTRACT

Due to the quick development of human activities and consumption of fossil fuels, the energy crisis and environmental pollution associated problems are a major concern of society. Algae have been proposed as a potential renewable fuel source was compared with the conventional oil crops, microalgae are more attractive as feedstock for biodiesel production, due to their high lipid content and photosynthesis efficiency. The apparent benefits of combining microalgal biodiesel production and wastewater treatment are to minimize the use of freshwater, reduce the cost of nutrient addition for microalgal cultivation and removal organic compounds. Even at optimum conditions, about 60 – 70% of the organic matter remains as residue in the wastewater after acidogenic fermentation of anaerobic biological treatment. In order to produce microalgal lipids by microalgal using volatile fatty acids as a sole carbon source that can be transformed to biodiesel fuel, more microalgal isolates were screened from seawater around Taiwan and then identified according to their 18S rRNA gene sequences and morphological characteristics. Chlorella pyrenoidosa G23 that were identified had utilized VFAs potential were selected for further study on their characteristics in growth and lipid producing. Acid-rich effluent generated from acidogenic biomethane production process was evaluated as substrate for lipid synthesis by integrating with mixotrophic cultivation of C.pyrenoidosa G23 microalgae. Growth parameters and biochemical composition of the microalga C.pyrenoidosa G23 cultivated under different mixotrophic conditions were determined and compared to those obtained from a photoautotrophic control culture. Mixotrophic microalgae showed higher specific growth rate, final biomass concentration and productivities of lipids than microalgae cultivated under photoautotrophic conditions. Moreover, supplementation of the with mixed volatile fatty acids solution (Acetic acid, Propionic acid and Butyric acid) led to a significant improvement in microalgal biomass production and carbohydrate utilization when compared with the culture inorganic culture medium, due to the presence of growth promoting nutrients in mixed volatile fatty acids (VFAs). Mixotrophic cultivation of C.pyrenoidosa G23 using the main wastewater biomethane production (WBMP) could be considered a feasible alternative to reduce the costs of microalgal biomass production, since it does not require the addition of expensive carbohydrates to the culture medium.



Keywords : Chlorella pyrenoidosa G23、mixed volatile fatty acids、Wastewater Biomethane Production


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