Study on Isolation of Native Marine Microalgae From Taiwan and Evaluation of Their Oil Production Po

胡哲豪、吳建一

E-mail: 345430@mail.dyu.edu.tw

ABSTRACT

Biodiesel refers to monoalkyl esters of long chain fatty acids transesterified from animal fat or vegetable oil. Biodiesel has been put into use in many areas, especially in the Europe and US. Annual USA production was estimated at 57 – 67 million liters, while Europe produced 500 million to 1 billion liters annually. The high cost of biodiesel, which is mainly due to the high costs of oil feedstock, is the main obstacle to its broader commercialization. Therefore, this study is to isolate marine microalgae with high oil productivities in Taiwan for producing biodiesel in order to minimize oil feedstock costs. In order to produce microalgal lipids 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. Two isolates Chlorella sp. Y 8-1 and Chlorella sp. G 2-1 that were identified had higher oil production potential were selected for further study on their characteristics in growth and lipid producing. In order to get higher algae biomass and lipid content, the effect of carbon and nitrogen sources and concentration, salinity, light intensities, light/dark cycle, temperature,additional supplements, and two-stage culture strategy on growth and lipid content of the both isolated microalgae were investigated. The lipid content reached 30% of dried cell weight in samples from G2-1 growth conditions: carbon source: 0.75 g-sucrose/L, nitrogen source: 0.1 g-urea/L, NaCl: 3%, NaHCO3: 0.2 g/L, light/dark cycle: 24/0 (h/h), light intensity: 7665 lux and temperature: 30 ℃ . For the isolated Y8-1 microalgae, the lipid content reached 35% of dried cell weight in samples from Y8-1 growth conditions: carbon source: 0.5 g-sucrose/L, nitrogen source: 0.25 g-urea/L, NaCl: 3%, NaHCO3: 0.2 g/L, light/dark cycle: 24/0, light intensity: 7665 lux and temperature: 30℃. The maximum specific growth rate (μm) of Y8-1 and G2-1 were 1.1 and 1.6 day-1, respectively. Furthermore, the experimental results also observed the Chlorella sp. G2-1 and Chlorella sp. Y8-1 cell size was increased with viincreasing NaCl concentration. Effect of iron on growth and lipid accumulation in marine microalgae Chlorella sp. G2-1 and Y8-1 were also investigated. In the experimental section of two stage culture, cells in the stationary growth phase were collected by centrifugation and re-inoculated into nitrogen-limiting media containing Fe3+. Total lipid content of Chlorella sp. G2-1 in cultures supplemented with 1.2 μM Fe3+ was up to 40% of dried cell weight. Microalgae Chlorella sp. G2-1 and Chlorella sp. Y8-1 mainly accumulate the following fatty acids: C16:0,C18:1,C18:2 and C18:3 have been suggested as very good candidates for fuel production.

Keywords : Chlorella sp.、lipid、fatty acids

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