Production of Fatty Acids by Microalgae in a Photobioreactor

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ABSTRACT

Microalgae is able to accommodate the natural environment well and can grow almost everywhere. Production of lipid through a culture of microalgae is superior to that from the cultivation of animals and plants, because microalgae can grow almost without the limitation of time or space, and can produce the lipids which are necessary to human being. In terms of the growth rate, the microalgae is not as good as fungus, but the cultivating condition for microalgae is much simpler. Moreover, the growth of microalgae does not require any high-priced carbon substrate, and microalgae has no fishlike smell. Therefore, microalgae can be used to produce fatty acids through photosynthesis. These fatty acids can be used to prevent cardiovascular diseases and cancer, and to reduce blood cholestero. In general, animals cannot effectively synthesize some of these fatty acids and must directly intake from food. Hence, polyunsaturated fatty acids play an important role in medical treatment and dietary aspects of human and other animals. An autotrophic unicell-algae Tetraselmis chui, obtainng from Tong Kung Marine Laboratory, was the strain used in this study. Initially, the strain was cultivated in a shaker and then continued in a 3-Liter photobioreactor. The cultivating temperature (20, 25 and 30°C) and the light cycle (8/16, 12/12, 16/8 and 24/0 L/D) are chosen to vary during the cultivation, and the intensity of light and the gas flow rate are fixed at 5,000 Lux and 3 vvm, respectively. In order to obtain the highest production of biomass, EPA and linolenic acid, the method of changing a variable at a time has been used to search for the optimal cultivating condition. Experimental results showed that, while cultivated at 25°C and a light cycle of 24/0 L/D, the dry biomass reached the highest (1.51 g/L). When cultivated at 25°C and a light cycle of 12/12 L/D, EPA reached the hightest amount of 3.32 mg/L. When cultivated at 30°C and a light cycle of 16/8 L/D, linolenic acid reached the hightest amount of 16.83 mg/L.

Keywords : Tetraselmis chui ; photobioreactor ; the optimal cultivated condition ; light cycle ; temperature ; EPA ; linolenic acid

Table of Contents

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