Production of ω-3 polyunsaturated fatty acids with marine microalgae

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ABSTRACT

Firstly, forty four microalgae strains from Tong Kung Marine Laboratory were screened in a basal medium of Walne for the production of ω -3 polyunsaturated fatty acids. Skeletonema costatum of Bacillarophyceae, Ellipsoidion sp. of Ellipsoidione, Nannochloropsis oculata of Eustigmatophyceae, Chlorella sp. E, Chlorella sp. F and Chlorella sp. (Chl-S8) of Chlorophyceae were the strains capable of producing 14.15-23.2 % of eicosapentaenoic acid (EPA) in lipid with a yield of 4.2-8.95 mg/L. Among them Ch lorella sp. F produced the highest amout of EPA. The Isochrysis galbana TK1 were the strains capable of producing 10.24-13.44 % and 2.67-4.4 mg/L of docosahexaenoic acid (DHA) in lipid content and yield, respectively. Secondly, this study investigated the effects of cultivation conditions on the cell growth, lipid production and docosahexaenoic acid (DHA) yield of Isochrysis galbana TK1. Each variable of interest was examined independently at different levels by holding the other variables constant to a basal set of conditions. The results showed that DHA yield increased with cultivation time until the 8th day, optimum cultivation temperature was 25 oC, optimum lighting was achieved by continuous illumination at 10,000 lux, optimum supply of carbon source was via bubbling of air enriched with 1 % CO2, urea was the best nitrogen source with a choice concentration of 1.0 mM, the ideal concentration of phosphorous source (KH2PO4) was 0.1 mM, and the best concentration of FeCl3 was 0.005 mM. These individua lly identified optima of each variable were combined in the final study and the cell mass, DHA content of the lipid and DHA yield after 8 days reached 0.51 g/L, 19.31 % and 9.56 mg/L, respectively. Thirdly, this study investigated the effects of cultivation conditions on the cell growth, lipid production and eicosapentanoic acid (EPA) yield of Chlorella sp. F. Each variable of interest was also examined independently at different levels by holding the other variables constant to a basal set of conditions . The results showed that EPA yield increased with cultivation time until the 8th day, optimum cultivation temperature was 25 oC, optimum lighting was achieved by 18 hr illumination per day at 10,000 lux, NaNO3 was the best nitrogen source with a choice concentration of 2.0 mM, the ideal concentration of phosphorous source (KH2PO4) was 0.1 mM, and the best concentration of FeCl3 was 0.05 mM. These individually identified optima of each variable were combined in the final study and the cell mass, EPA content of the lipid and EPA yield after 8 days reached 0.88 g/L, 22.34 % and 15.12 mg/L, respectively.

Keywords : Isochrysis galbana TKI ; Chlorella sp. F Microalge ; EPA ; DHA ; Isochrysis galbana TKI ; Chlorella sp. F

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