Estimation of optimum specific light intensity per cell on a high-cell-density continuous culture of Chlorella zofingiensis not limited by nutrients or CO2

ABSTRACT

To determine the optimum light intensity per cell required for rapid growth regardless of cell density, continuous cultures of the microalga Chlorella zofingiensis were grown with a sufficient supply of nutrients and CO2 and were subjected to different light intensities in the range of 75ï 1000 εE mī 2 sī 1. The cell density of culture increased over time for all light conditions except for the early stage of the high light condition of 1000 εE mī 2 sī 1. The light intensity per cell required for the high specific growth rate of 0.5 dayī 1 was determined to be 28ï 45 εE g-dsī 1 sī 1. The specific growth rate was significantly correlated to light intensity ($y = 0.721 \times x/(66.98 + x)$, $r2 = 0.85$, $p < 0.05$). A high specific growth rate was maintained over a range of light intensities (250ï 1000 εE mī 2 sī 1). This range of light intensities suggested that effective production of C. zofingiensis can be maintained outdoors under strong light by using the optimum specific light intensity.

Keyword: Biomass production of microalgae; Chlorella zofingiensis; High-cell-density culture; Nutrient and CO2 supply; Optimum light condition