

Abstract

The effects of culture conditions on biomass loss during the dark period (night biomass loss) and the biochemical composition of *Chlorella pyrenoidosa* cells cultured under a repeated light/dark cycle were investigated. During the night, decreases were observed in the biomass concentration and carbohydrate contents of the cells while their protein content increased. These changes imply that in the absence of light energy, intracellularly stored carbohydrate is metabolized as an energy source. This energy is used in part for cell maintenance and in part for protein synthesis. The changes were maximum during the exponential growth phase, decreased with the age of the culture, and were affected by the culture conditions during both the day and night. The night biomass loss decreased with increasing temperature during the day, but was greater in cultures grown under high light intensity. At any given growth phase, the night biomass loss increased with increasing cell carbohydrate content. The culture conditions during the day affected the night biomass loss through their influence on the cell biochemical composition. Although biomass loss could be reduced by lowering the temperature and avoiding mixing of the culture during the night, the loss could not be completely prevented. Since *Chlorella* cells can grow heterotrophically on some organic carbon sources during the dark period, a cyclic light-autotrophic/dark-heterotrophic culture was investigated as a means of preventing night biomass loss. By adding glucose to the culture during the night, continuous cell growth during both day and night was achieved without adverse effect on the biochemical composition of the cells. Similar results were obtained using ethanol or acetate as an alternative organic carbon source. These latter compounds are preferred to glucose as organic carbon sources in order to reduce the risk of contamination.

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