

Abstract

Although the potential of photosynthetic microorganisms for production of various metabolites and in environmental bioremediation is recognized, their practical application has been limited by the difficulty in supplying light efficiently to photobioreactors. Various types of photobioreactor with high illumination to volume ratios have been proposed, but most are limited by cost, mass transfer, contamination, scale-up or a combination of these. The problem of light supply to photobioreactors can be solved by developing photosynthetic cell cultivation systems where light is either substituted or supplemented. Many strains of photosynthetic cells are capable of heterotrophic growth under dark conditions and their heterotrophic culture can be used for efficient production of biomass and some metabolites. However, light is absolutely required for efficient production of some metabolites. In such cases, there is a need to supplement the heterotrophic with photoautotrophic metabolism. In photoheterotrophic (mixotrophic) culture, the photoautotrophic and heterotrophic metabolisms can be exploited for efficient production of useful metabolites but it has many problems such as process optimization in terms of making a balance between the photoautotrophic and heterotrophic metabolism. Another promising system is the sequential heterotrophic/ photoautotrophic cultivation system, where the cells are cultivated heterotrophically to high concentrations and then passed through a photobioreactor for accumulation of the desired metabolite(s). Furthermore, cyclic photoautotrophic/heterotrophic cultivation system can be used to achieve continuous cell growth under day/night cycles. This involves cultivating the cells photoautotrophically using solar light during the day and then adding controlled amount of organic carbon source during the night for heterotrophic growth. In this review, these various systems are discussed with some specific examples.

Do you want to **read the rest** of this article?

Request full-text

Light requirement and photosynthetic cell cultivation -.... Available from:

https://www.researchgate.net/publication/225974115_Light_requirement_and_photosynthetic_cell_cultivation_-_Development_of_processes_for_efficient_light_utilization_in_photobioreactors