

Mixotrophic Cultivation of Microalgae as a Feasible Strategy for Carotenoid Production

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Abstract : Carotenoids are a group of metabolites in mostly photosynthetic organisms such as plants and microalgae and have wide applications in cosmetics, food, feed, and health industries. Although phototrophic cultivation of microalgae has been developed to produce some carotenoids for decades, most carotenoids are currently synthesized chemically at industrial scales because of affordable production costs. Chemical carotenoids are regarded not as safe for human beings as natural carotenoids and are restricted only for animal feed markets, and the industries call for inexpensive sources of natural products. Microalgae grow much quicker in mixotrophy than in phototrophy, and thus mixotrophic cultivation processes have great potential to reduce the production cost of carotenoids from microalgae. However, much more expensive photobioreactor systems and more strictly controlled sterile processes are needed to avoid contamination by heterotrophic organisms during mixotrophic cultivation processes, which makes mixotrophy, in fact, much more expensive than phototrophic cultivation. Recently technical breakthroughs have been reported to overcome contamination problems in photobioreactor systems traditionally used for phototrophic cultivation, and a much lower process cost of mixotrophic cultivation than that of phototrophic cultivation might be achieved for carotenoid production. These reviews intend to summarize recent technical advancements in mixotrophic cultivation of microalgae, to evaluate the economic viability of carotenoid production from mixotrophically cultivated microalgae, and to prospect mixotrophy as a strategy to produce a variety of carotenoids for industrial applications.

Keywords : microalgae, carotenoid, mixotrophy, biotechnology

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