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Application of growth-phase based light-feeding strategies to simultaneously enhance *Chlorella vulgaris* growth and lipid accumulation

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Abstract

Considering the variations of optimal light intensity required by microalgae cells along with growth phases, growth-phase light-feeding strategies were proposed and verified in this paper, aiming at boosting microalgae lipid productivity from the perspective of light conditions optimization. Experimental results demonstrate that under an identical time-averaged light intensity, the light-feeding strategies characterized by stepwise incremental light intensities showed a positive effect on biomass and lipid accumulation. The lipid productivity (235.49 mg L^{-1} d^{-1}) attained under light-feeding strategy V (time-averaged light intensity: 225 μmol m^{-2} s^{-1}) was 52.38% higher over that obtained under a constant light intensity of 225 μmol m^{-2} s^{-1}. Subsequently, based on light-feeding strategy V, microalgae lipid productivity was further elevated to 312.92 mg L^{-1} d^{-1} employing a two-stage based light-feeding strategy V_{560} (time-averaged light intensity: 360 μmol m^{-2} s^{-1}), which was 79.63% higher relative to that achieved under a constant light intensity of 360 μmol m^{-2} s^{-1}.

Keywords: Microalgae; Growth-phase; Light-feeding strategy; Optimization; Lipid productivity

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