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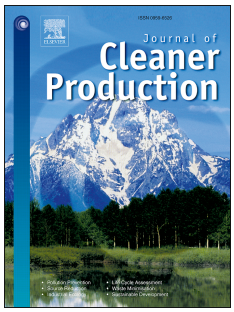

A novel organic dye-based approach to increase photon flux density for enhanced microalgal pigment production

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A novel organic dye-based approach to increase photon flux density for enhanced microalgal pigment production

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Abstract

Numerous research efforts have channeled toward microalgal cultivation systems due to their potential benefit in several applications. Microalgae utilize specific wavelengths of light for photosynthesis. Manipulation of incident irradiance could increase light availability to algae which could enhance pigment production. This study sought to enhance light availability to *Chlamydomonas reinhardtii* using organic dyes as light converters, thereby improving microalgal pigment production. Diphenylanthracene, Diphenyloxazole, Rhodamine 8G and Lumogen yellow were evaluated at varying concentrations in methanol, ethanol, and acetone. Spectrophotometric analyses revealed that most of the dyes had higher fluorescent intensities in methanol at 10 mgL^{-1}. Lumogen yellow exhibited the highest areal intensity but did not increase biomass production. Rhodamine 8G grown algae increased chlorophyll and carotenoid concentrations by 45 wt.% and 36 wt.%, respectively. Light stress was observed by increased non-photochemical quenching from approximately 0.05 to above 0.5 and decreased quantum efficiencies of photosystem 2. This novel light manipulation strategy will potentially enable more economical production of high-value microalgal bioproducts using natural sunlight as opposed to artificial light.