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Microalgae as Sustainable Renewable Energy Feedstock for Biofuel Production

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Abstract

The world energy crisis and increased greenhouse gas emissions have driven the search for alternative and environmentally friendly renewable energy sources. According to life cycle analysis, microalgae biofuel is identified as one of the major renewable energy sources for sustainable development, with potential to replace the fossil-based fuels. Microalgae biofuel was devoid of the major drawbacks associated with oil crops and lignocelluloses-based biofuels. Algae-based biofuels are technically and economically viable and cost competitive, require no additional lands, require minimal water use, and mitigate atmospheric CO2. However, commercial production of microalgae biodiesel is still not feasible due to the low biomass concentration and costly downstream processes. The viability of microalgae biodiesel production can be achieved by designing advanced photobioreactors, developing low cost technologies for biomass harvesting, drying, and oil extraction. Commercial production can also be accomplished by improving the genetic engineering strategies to control environmental stress conditions and by engineering metabolic pathways for high lipid production. In addition, new emerging technologies such as algal-bacterial interactions for enhancement of microalgae growth and lipid production are also explored. This review focuses mainly on the problems encountered in the commercial production of microalgae biofuels and the possible techniques to overcome these difficulties.

Keywords: microalgae, microalgae biodiesel, biofuel production, renewable energy, photobioreactors, lipid prod

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