Process Engineering for Production of Microalgal Biomass with Higher Productivity

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Microalgae have gained significant interest as prospective alternative to traditional fuel resources. Presently, microalgae based biofuel production suffers from economical infeasibility attributed to low biomass titer or productivity and associated higher operational & harvesting costs. For microalgae to be a viable feedstock for biofuel production, it is therefore requisite to focus current research on achieving high biomass yield or productivity and avoiding overconsumption of nutrients. In the present study, we have demonstrated a process engineering strategy for high cell density cultivation of the strain *Chlorella* sp. FC2 IITG with higher biomass productivity under photoautotrophic condition. The strategy involves optimization of CO_2 concentration in the inlet gas stream & its flow rate, intermittent feeding of the limiting nutrients (phosphate and trace elements) based on experimentally designed correlation and dynamic change in light intensity to maintain a predefined specific growth rate. The process engineering strategy has enabled the cells to access the nutrients at their respective optimal concentration range during the entire period of cultivation. Hence, the cells are able to grow at their maximum specific growth rate for prolonged duration as opposed to the uncontrolled batch thereby, resulting in higher biomass productivity. The process strategy also opens up scope for further economic feasibility analysis and scale up for large-scale commercial applications.