

Utilization of *Chlorella vulgaris* to fixate a high concentration of carbon dioxide in a compost-based medium

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Abstrak

Massive use of fuels by industry increase carbon dioxide (CO₂) emissions significantly. *Chlorella vulgaris* (*C. vulgaris*) is well known for its ability to fixate CO₂ and synthesize it to a lipid. As industry usually emits high concentrations of CO₂, it is necessary to investigate the behavior of microalgae in regard to CO₂ inflow. We studied cultivation of *C. vulgaris* in a photobioreactor (volume 18L) in a compost-based medium under illumination at 3000 lux for 90 hours. We show that initial cell density 0.137 g·dm⁻³ is able to fixate CO₂ up to 30.31 g·dm⁻³·day⁻¹ (93.56%) under a CO₂ inflow of 23.80 g·hour⁻¹ with biomass productivity 0.44 g·dm⁻³·day⁻¹ and lipid yield 0.0795 g lipid·g cell⁻¹, and it also shows the potential to fixate carbon dioxide 28.43 g·dm⁻³·day⁻¹ (31.51%) and produce high lipid amounts (0.0739 g·g⁻¹) under a carbon dioxide inflow 48.17 g·hour⁻¹. Cultivation with a higher initial cell density (0.325 g·dm⁻³) shows better resistance under carbon dioxide inflow 48.17 g·hour⁻¹ with carbon fixation 37.95 g·dm⁻³·day⁻¹ (58%), biomass production 0.82 g·dm⁻³·day⁻¹, lipid yield 0.0834 g·g⁻¹, and good potential under carbon dioxide inflow 65.96 g·hour⁻¹. This research shows the potential of *C. vulgaris* in reducing high concentrations of CO₂, which is beneficial for biomass and/or lipid production. These are in turn useful for biodiesel and food supplements. Further study is necessary for adapting this potential on a commercial scale.