

## 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 (CO<sub>2</sub>) emissions significantly. *Chlorella vulgaris* (*C. vulgaris*) is well known for its ability to fixate CO<sub>2</sub> and synthesize it to a lipid. As industry usually emits high concentrations of CO<sub>2</sub>, it is necessary to investigate the behavior of microalgae in regard to CO<sub>2</sub> 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<sup>-3</sup> is able to fixate CO<sub>2</sub> up to 30.31 g·dm<sup>-3</sup>·day<sup>-1</sup> (93.56%) under a CO<sub>2</sub> inflow of 23.80 g·hour<sup>-1</sup> with biomass productivity 0.44 g·dm<sup>-3</sup>·day<sup>-1</sup> and lipid yield 0.0795 g·lipid·g<sup>-1</sup>·cell<sup>-1</sup>, and it also shows the potential to fixate carbon dioxide 28.43 g·dm<sup>-3</sup>·day<sup>-1</sup> (31.51%) and produce high lipid amounts (0.0739 g·g<sup>-1</sup>) under a carbon dioxide inflow 48.17 g·hour<sup>-1</sup>. Cultivation with a higher initial cell density (0.325 g · dm<sup>-3</sup>) shows better resistance under carbon dioxide inflow 48.17 g·hour<sup>-1</sup> with carbon fixation 37.95 g·dm<sup>-3</sup>·day<sup>-1</sup>(58%), biomass production 0.82 g·dm<sup>-3</sup>·day<sup>-1</sup>, lipid yield 0.0834 g·g<sup>-1</sup>, and good potential under carbon dioxide inflow 65.96 g·hour<sup>-1</sup>. This research shows the potential of *C. vulgaris* in reducing high concentrations of CO<sub>2</sub>, 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.