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-basedmedium 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 glipid·gcell-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.