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Culturing of *Selenastrum* on diluted composting fluids; conversion of waste to valuable algal biomass in presence of bacteria

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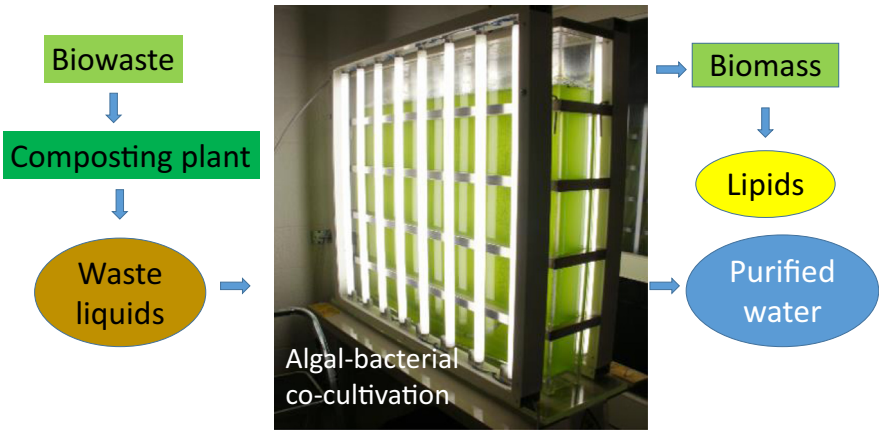
HIGHLIGHTS

- Composting leachates supported growth of both algae and bacteria in co-cultures.
- Nutrients from composting leachates were efficiently converted to algal biomass.
- Prolonged cultivation time and CO_2 feed enhance the lipid production in co-cultures.
- In commercialization, co-culturing is a realistic alternative.

GRAPHICAL ABSTRACT



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ABSTRACT

Growth and fatty acid production of microalga *Selenastrum* sp. with associated bacteria was studied in lab-scale experiments in three composting leachate liquids. Nutrient reduction in cultures was measured at different initial substrate strengths. A small, pilot-scale photobioreactor (PBR) was used to verify lab-scale results. Similar growth conditions supported growth of both *Selenastrum* and bacteria. CO_2 feed enhanced the production of biomass and lipids in PBR (2.4 g L^{-1} and 17% DW) compared to lab-scale (0.1–1.6 g L^{-1} and 4.0–6.5% DW) experiments. Also prolonged cultivation time increased lipid content in PBR. At both scales, NH_4-N with an initial concentration of ca. 40 mg L^{-1} was completely removed from the biowaste leachate. In lab-scale, maximal COD reduction was over 2000 mg L^{-1}, indicating mixotrophic growth of *Selenastrum*. Co-cultures are efficient in composting leachate liquid treatment, and conversion of waste to biomass is a promising approach to improve the bioeconomy of composting plants.

1. Introduction

Microalgae are promising as beneficial organisms in production of renewable energy or valuable metabolites such as fatty acids

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