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Short Communication

A cost-effective strategy for the bio-prospecting of mixed microalgae with high carbohydrate content: Diversity fluctuations in different growth media

Glenda Cea-Barcia, Germán Buitrón *, Gloria Moreno, Gopalakrishnan Kumar

Laboratory for Research on Advanced Processes for Water Treatment, Instituto de Ingeniería, Unidad Académica Juriquilla, Universidad Nacional Autónoma de México, Blvd. Juriquilla 3001, Queretaro 76230, Mexico

HIGHLIGHTS

- A cost-effective strategy for cultivation of indigenous microalgae was proposed.
- Diversity decreased when microalgae were grown in secondary effluent.
- *Scenedesmus* sp., *Keratococcus* sp. and *Golenkinia* sp. were the predominant genera.
- High carbohydrate content was observed for microalgae growth in secondary effluent.

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ABSTRACT

In recent years, widespread efforts have been directed towards decreasing the costs associated with microalgae culture systems for the production of biofuels. In this study, a simple and inexpensive strategy to bio-prospect and cultivate mixed indigenous chlorophytes with a high carbohydrate content for biomethane and biohydrogen production was developed. Mixed microalgae were collected from four different water-bodies in Queretaro, Mexico, and were grown in Bold's basal mineral medium and secondary effluent from a wastewater treatment plant using inexpensive photo-bioreactors. The results showed large fluctuations in microalgal genera diversity based on different culture media and nitrogen sources. In secondary effluent, *Golenkinia* sp. and *Scenedesmus* sp. proliferated. The carbohydrate content, for secondary effluent, varied between 12% and 57%, and the highest volumetric and areal productivity were 61 mg L^{-1} d^{-1} and 4.6 g m^{-2} d^{-1}, respectively. These results indicate that mixed microalgae are a good feedstock for biomethane and biohydrogen production.

1. Introduction

Microalgae have recently demonstrated various advantages due to their ease of growth, high accumulation of lipids and carbohydrates during starvation conditions and higher productivity (Bahadar and Bilal Khan, 2013; González-Fernández and Ballesteros, 2012). Biofuels produced from microalgae, such as bioethanol, biodiesel, biohydrogen and biomethane, have been gaining more attention in recent years for use as fuel sources in lieu of fossil fuels, which are being depleted daily due to overextraction (Bahadar and Bilal Khan, 2013; Chisti, 2013). To date, research efforts have been primarily focused on the limitations for the commercialization of microalgal biofuels, such as inexpensive and energy efficient biomass production methods, the supply of N and P nutrients, water constraints and the availability of concentrated carbon dioxide. Moreover, microalgal biotechnology provides new opportunities for wastewater treatment (Chisti, 2013). The bio-prospecting of unique microalgal strains could lead the way to finding suitable microalgal strains for the production of biofuels from biomass (Mutanda et al., 2011). However, using pure cultures or strains of microalgae presents difficulties in industrial applications due to contamination issues. The exploitation of mixed indigenous microalgae cultures may be a possible solution and has the capacity for commercialization. A previous report on the potential of mixed microalgae for biodiesel production provided information about lipid content (Venkata Mohan et al., 2011). However, it was lacking data from different reactor types for growth and carbohydrate content analyses. The carbohydrate content is important for production of gaseous fuels such as

* Corresponding author. Tel.: +52 442 1926165; fax: +52 442 1926185.
E-mail address: GbuitronM@ii.unam.mx (G. Buitrón).

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