

Applicant: Lizzette Moreno García
Institution: McGill University
Supervisor: G. S. V. Raghavan

Abstract

Effect of environmental factors on the biomass and lipid production of microalgae grown in wastewaters

Moreno-Garcia, L.¹, Gariepy, Y.¹, Barnabe, S.² & Raghavan, G.S.V.¹

¹McGill University, Canada

²Université du Québec à Trois-Rivières, Canada

The cultivation of a microalgae-bacteria consortium in a ternary blend of wastewaters was carried out by varying three variables (organic carbon content in the form of glycerol, CO₂ addition, and light intensity) using a 2³ full factorial design. An analysis of variance was performed to assess the effects of each factor and their interactions on the responses of biomass productivity, lipid content, and nutrients uptake. Also, a principal component analysis (PCA) was conducted to study the correlations among the variables. Light intensity and its interaction with organic carbon were the main factors affecting the growth. The biomass productivity (maximum value of 106.3 mg·L⁻¹·d⁻¹) was negatively affected by organic carbon and CO₂ addition and positively affected by light intensity. Higher lipid contents (maximum value of 17.2%) were found at conditions of low light intensity and high organic carbon in the cultures. Lipid production was related to ammonia-N uptake by the cells. The addition of organic carbon aided the uptake of nitrates-N, ammonia-N, and total organic carbon, and the light intensity reduced these values (maximum values of 100%, 90% and 86%, respectively). The PCA corroborated the relations found between the factors and responses in the factorial analysis and revealed correlations among the responses measured. The main source of nitrogen at conditions of high light intensities was nitrates, while ammonia was the preferred nitrogen source when the cultures were grown under high organic carbon contents as it was indicated by the values of the specific rate of nutrients uptake.