

STUDY OF MIXOTROPHIC GROWTH OF THREE SPECIES OF MICROALGAE FOR BIODIESEL PRODUCTION

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Abstract

The use of microalgae for biodiesel production has great advantages over other raw materials that are currently being used. The fact that they have a high biomass production, rapid growth and do not compete with food production make the study of microalgae very important to enable the production of biodiesel originated from them on a large scale.

Key words:

microalgae, biodiesel, mixotrophic growth

Introduction

Microalgae have different ways of energetic metabolism: autotrophic, mixotrophic and heterotrophic.¹ The mixotrophic metabolism is defined as one that uses both external organic carbon and solar power as an energy source. The aim of this work was to study three species of microalgae: *Chlorella Vulgaris*, *Desmodesmus brasiliensis*, and *Desmodesmus* sp. in mixotrophic conditions of growth, using glucose and glycerin how external organic carbon sources.

Results and Discussion

Microalgae were grown in BG-11² medium supplemented with 10g/L of carbon source (glucose or glycerin). The growth was carried out in 250ml Erlenmeyer containing 200mL of culture medium and 10% of microalgae inoculum. The experiment was carried out under the following conditions: the luminous flux of 62 $\mu\text{E m}^{-2} \text{s}^{-1}$ for 24h, shaking rate of 250 rpm and temperature of 26 ± 4 ° C for a period of 9 days. All the experiments were performed in duplicate.



Image 1. Experiment conditions

The cell concentration was measured using a UV spectrophotometer (Agilent Technologies, Cary model 60). At the end of the growing period, the biomass was removed by centrifugation (Eppendorf, model 5810) at 4500 rpm and extraction of lipids was carried out by the Bligh and Dyer procedure.³

In the cultivation with glucose, *Chlorella Vulgaris* obtained a final biomass concentration of 3,32 g/L, while *Desmodesmus* sp. obtained 3,64 g/L and *Desmodesmus brasiliensis* obtained 3,82 g/L.

In the cultivation enrich with glycerin, the *Chorella Vulgaris* obtained 0,31g/L and *Desmodesmus brasiliensis* obtained 0.20 g/L. The species *Desmodesmus* sp. showed no growing capabilities. Growth rates are shown in Chart 1.

Chart 1. Growth rate of three microalgae species.

Species μ (day ⁻¹)	<i>Chorella vulgaris</i>	<i>Desmodesmus brasiliensis</i>	<i>Desmodesmus</i> sp.
Glucose ⁴	0.661	0.699	0.446
Glycerin	0.085	0.069	-
Autotrophic ⁵	0.089	0.101	0,070

Chart 2 shows the accumulation of lipids. *Desmodesmus brasiliensis* showed less accumulation of lipids with glucose and the highest with glycerine, while *Desmodesmus* sp. had the highest lipid accumulation with glucose.

Chart 2. Lipid accumulation.

Species Lipids (%)	<i>Chorella vulgaris</i>	<i>Desmodesmus brasiliensis</i>	<i>Desmodesmus</i> sp.
Glucose ⁴	13.20	5.69	19.45
Glycerin	6,84	24,13	-

Conclusions

The results show that glucose is the best among the carbon sources presented for allowing a high biomass concentration.

Considering the cultivation using glucose, *Desmodesmus brasiliensis* showed the highest biomass concentration, but the worse lipid accumulation. *Desmodesmus* sp. obtained the best results in lipids accumulation. Combining biomass and lipid accumulation, we conclude that *Desmodesmus* sp. has the biggest potential to be used as source for biodiesel production.

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