CO2 BIOCAPTURE IN PHOTOBIOREACTORS USING MARINE MICROALGAE *NANNOCHLOROPSIS GADITANA*

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Abstract- All international commitments force a progressive reduction of carbon dioxide emissions to the atmosphere. Because the Andalusian coast is characterized for its high solar radiation index and temperature variation interval, it becomes a good place for the use of microalgae for this purpose. Therefore, the study of N. gaditana in function of its carbon dioxide capture capacity and biomass utility was chosen for the analysis of CO2 capture in large intensive culture photobioreactors.

Keywords- Photobioreactor, CO2 fixation, N. gaditana, marine microalgae.

The photobioreactors were specially designed to obtain cultures with high cellular densities with the possibility of realizing a continuous analyze of gas transfer between gas phase and water, this and other possible solutions applied for its control, make of this initiative a very innovative technology (Figure 1).

"Fig 1." Specially designed photobioreactors.

N. gaditana cultures were introduced in the photobioreactors with initial cellular densities of 7 x 106 cell mL-1. This strain is characterized for a long lag phase period as shown in Figure 2; once the exponential phase was reached the CO2 injections were followed (14 µL/min). For each day of the essay, samples for cellular counting, biomass, organic carbon determination and inorganic carbon determination were collected. Also continuous data of control parameters such as dissolved oxygen, pH, temperature, light intensity, nutrients and CO2 balance were stored in a PLC.

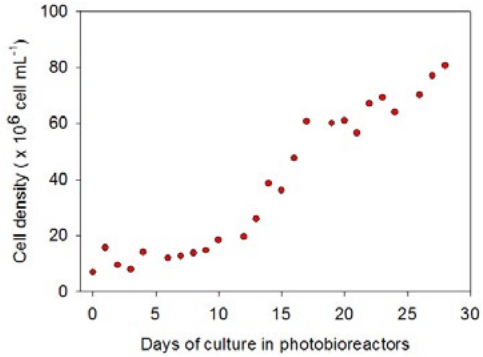

Fig. 2." Typical N. gaditana cellular density evolution.

During the essay clear capture of CO2 by N. gaditana was observed. Inlet values of CO2 concentration resulted always higher than the ones measured from the outlet of the reactor with variation differences from 100 to 300 µmol mol-1 (Figure 3).

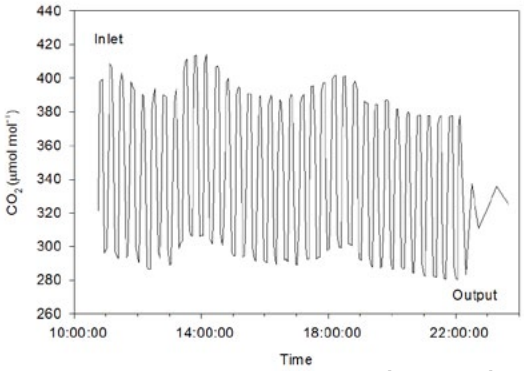

Fig. 3." CO2 concentration variations between inlet and outlett of the photobioreactors

All these essays followed with this particular strain should be completed with other selection of marine microalgae to be able to estipulate which of them configure the best experimental conditions and result. Also, the main aim of this study is to be able to extrapolate these results obtained in laboratory conditions to industrial scale, the information obtained may be a very interesting tool to be able to establish the viability of microalgae as a proceeding to reduce the CO2 emissions into the atmosphere due to industries situated near the coast.

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