# INFLUENCE OF ENVIRONMENTAL CONDITIONS ON *CHRYSOCHROMULINA ROTALIS* FOR THE PRODUCTION OF BIOACTIVE COMPOUNDS AND HIGH-VALUE COMPOUNDS

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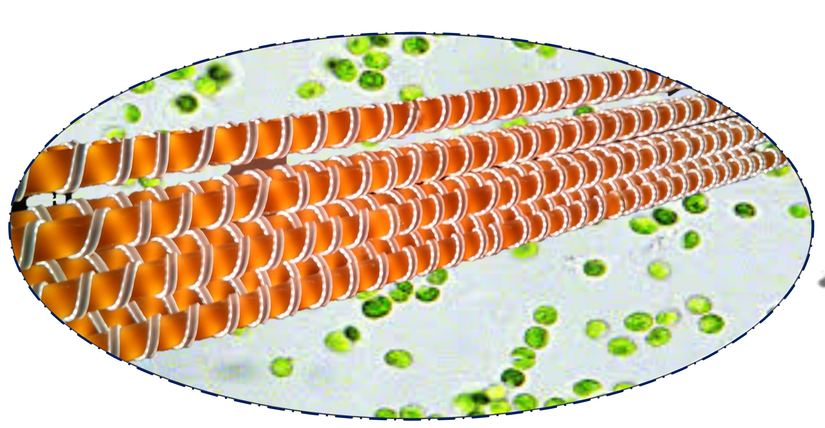
IX SIMPOSIO de Investigación EN CIENCIAS EXPERIMENTALES

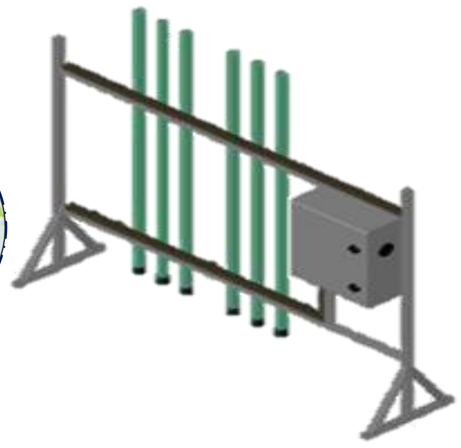
## INTRODUCTION

Identification of appropriate environmental culture conditions is a prerequisite for the maximization of microalgae biomass and bioactive production. Phylum haptophyta includes some flagellated microalgae known to be producers of high value biomolecules. *Chrysochromulina rotalis*, a type of haptophyte, has previously been cultivated on a small scale and has been shown to be a producer of carotenoids as fucoxanthin[1], fatty acids as DHA[2] and bioactive compounds[3]. However, a comprehensive optimization process of culture conditions has not been performed yet. In addition, most flagellated microalgae are difficult to maintain for a long time in cell banks since they usually do not allow cultivation in a solid medium. This, also makes it difficult to obtain monoalgal cultures.

## OBJECTIVES

The target of this work is to optimize the operational environmental conditions (salinity, irradiance and temperature) for the cultivation of *C. rotalis*, which maximize the production of high added value products and bioactive compounds, cultivated photoautotrophically and in an economically sustainable way.





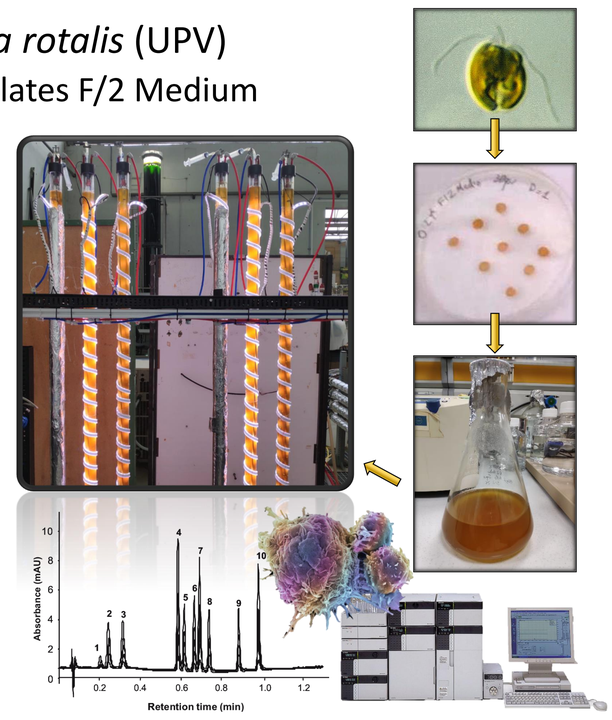
## MATERIAL AND METHODS

- **Biomass:** *Chrysochromulina rotalis* (UPV)
- **Strain maintenance:** Petri plates F/2 Medium Agar (0,1 – 1)%[4].
- **Photobiorreactor:**

2,5L Bubble column with LEDs[5] (30-637 µmol·m$^{-2}$·s$^{-1}$), pH 8,5 at (15–35)±1°C in discontinuous mode.

- **Biomass characterization:**

Carotenoids by HPLC-DAD (Cerón García et al., (2018)[6] and fatty acids by gas chromatography (Rodríguez Ruiz et al., (1998)[7]. Antiproliferative activity against 4 tumor lines.




## RESULTS AND DISCUSSION

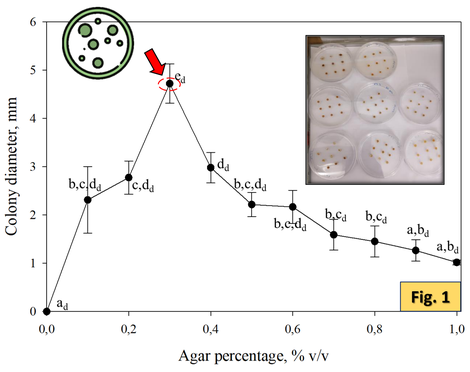



**Figure 1.** Growth in diameter of *C. rotalis* grown in Petri dishes with variable proportions of technical agar.

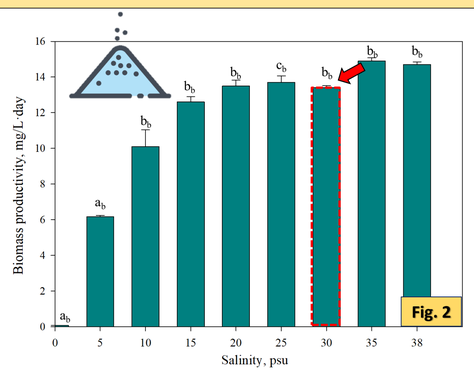



**Figure 2.** Results of the biomass productivity of *C. rotalis* in mg/L·day for each salinity value.

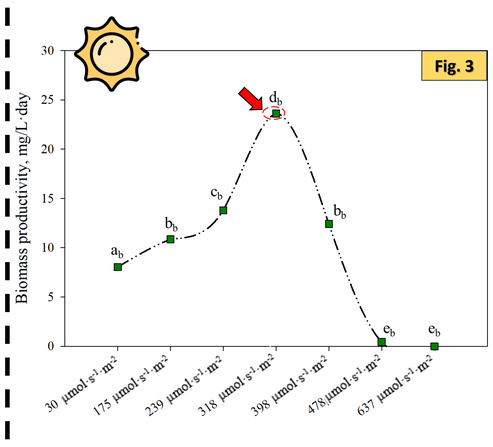
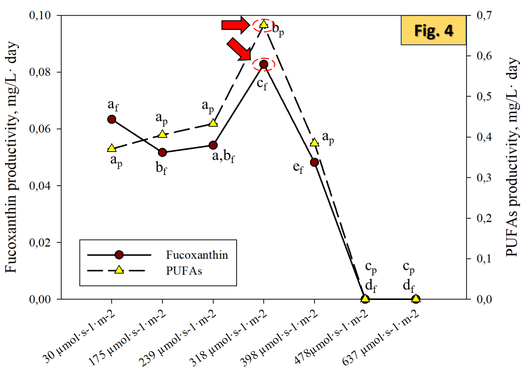



**Figure 3.** Biomass productivity of *C. rotalis* in mg/L·day for each irradiance value.

**Figure 4.** Productivity of fucoxanthin and PUFAs of C. *rotalis* in mg/L·day for each irradiance value.



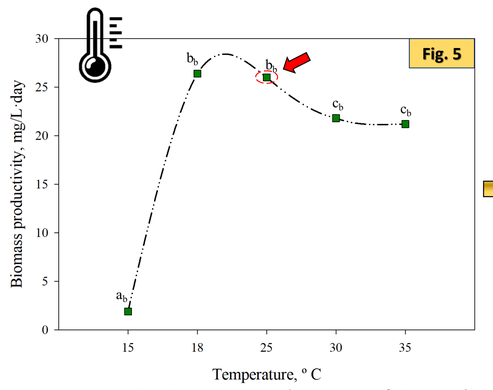




**Figure 5.** Biomass productivity of *C. rotalis* in mg/L·day for each temperature value.

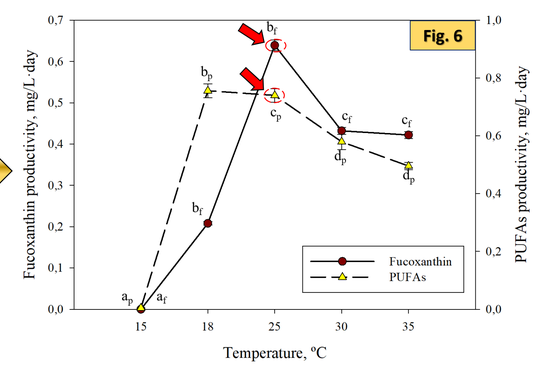



**Figure 6.** Productivity of fucoxanthin and PUFAs of *C. rotalis* in mg/L·day for each temperature value.

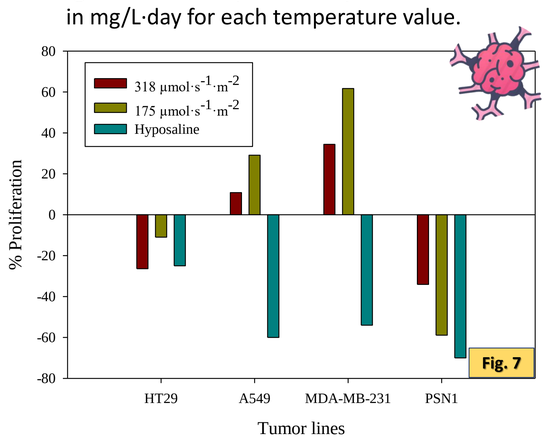



**Figure 7.** Percentage of proliferation of 4 types of human tumor cells in assays using methanolic extracts of biomass obtained in the optimization of average irradiance and hyposaline shock. A negative percentage indicates a recess in proliferation due to cytotoxicity.

*HT-29 (colon adenocarcinoma)*
*A549 (lung carcinoma)*
*PSN-1 (pancreatic adenocarcinoma)*
*MDA-MB-231 (breast adenocarcinoma)*

## CONCLUSIONS

- ✓ Optimal growth value for **cultivation and maintenance** in Petri dishes for the microalgae *C. rotalis* in the **0.3% agar** condition, not described to date for any species of haptophyte.
- ✓ **Optimal productivity at 30PSU, 318 µmol·s$^{-1}$·m$^{-2}$** of **$I_{avg}$** using **LEDs** and **25ºC** temperature ⇒ $P_{biomass}$: 13, 23.6, 26 mg/L·day, respectively.
- ✓ Finally, a **high antitumor and antiproliferative capacity** has been demonstrated due to the **cytotoxicity** of the tested biomasses, obtained under **hyposalinity** and optimal irradiance conditions.
- ✓ Thus, ***C. rotalis*** is proposed as a haptophytic microalgae that could be scaled at an **industrial level**, with significant applications in the **pharmaceutical industry and the fight against human tumor cells.**

## REFERENCES

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