P-032 - MODULATION OF FATTY ACID PROFILE IN NANNOCHLOROPSIS OCULATA ADAPTATION TO TEMPERATURE STRESS

Sérgio Sousa[1]; Luís Alcalá[1]; Ana C. Freitas[1]; Ana M. Gomes[1]; Ana P. Carvalho[2]

1 - Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Arquiteto Lobão Vital, 172, 4200-374 Porto, Portugal; 2 - REQUIMTE/LAQV – ISEP, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Rua Dr. António Bernardino de Almeida 431, 4249-015 Porto, Portugal

Background

Microalgae are known as a potential source of specific lipids, namely polyunsaturated fatty acids (PUFA), important from both nutritional and functional standpoints (Matos *et al*., 2017). Those PUFA are usually produced under stress conditions, but such conditions concomitantly decrease cell yields (Chen *et al*., 2017). The aim of this research work was to modulate the stress provided to cultures of *Nannochloropsis oculata* in order to enhance PUFA production, while ensuring a steady increase in biomass. Temperature was the selected stress parameter, given its known effects on PUFA production: changes in lipid composition in response to temperature changes are a major cellular response to guarantee membrane fluidity adjustment (Renaud *et al*., 1995).

Method

In order to assess the impact of temperature variations on lipid production and composition, an experiment was designed, where temperature cycles varied as follows: the culture was initially grown at 22.5 ºC for 3 days, upon which temperature was reduced to 10 ºC. After 3 more days, initial temperature was reestablished, for 4 days, and once again it was reduced to 5 ºC and left at such low temperature for 5 days. At the end of each temperature cycle, both growth (through optical density and cell counts) and lipid values (total content and fatty acid profile) were assessed using gravimetric and GC chromatography methods.

Results & Conclusions

Results showed that a gradual variation in temperature has no substantial negative impact on culture growth. Indeed, when temperature was decreased, cell growth was not affected and lipid values increased. Furthermore, the intracellular lipid content consistently increased within the temperature decreases along the growth cycle. Concerning the fatty acid profile, the content of the PUFA gamma linolenic acid and eicosapentaenoic acid was inversely related with temperature, whereas the ratio n6/n3 and the atherogenicity index (AI), which are related to the predisposition of lipids to cause cardiovascular diseases, were directly related with temperature.
From the abovementioned results, it can be concluded that a controlled temperature reduction throughout growth can be used to modulate lipid profiles and production in microalgal cultures.

References & Acknowledgments

Matos *et al*., 2017 Food Funct DOI: 10.1039/C7FO00409E
Chen *et al*., 2017 Bioresour Technol 1198-1206
Renaud *et al*., 1995 J Appl Phycol 595-602

This work was supported by National Funds through project Norte-01-0145-FEDER-000011-RL1–QUALIFOOD, FCT (Fundação para a Ciência e a Tecnologia) through projects UID/Multi/50016/2013 and SFRH/BD/105304/2014 and by FCT/MEC (PIDDAC) project reference IF/00588/2015.
Keywords: Lipids, polyunsaturated fatty acids, microalgae, stress modulation