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Light quality- a tool to modulate *Ulva* sp. growth, pigments production and antioxidant capacity

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Helena Melo Amaro is a microbiologist graduated in 2008 at Biotechnology School of Portuguese Catholic University (ESB-UCP). In 2017 she obtained her PhD degree in Biomedical Sciences at Biomedical Sciences institute Abel Salazar of University of Porto, with a thesis entitled “Research and Characterization of Bioactive Compounds with Potential Pharmaceutical Application Produced by Microalgae and Cyanobacteria”.
She is currently a researcher in a CIIMAR, in an European project that aims the exploitation for Innovative Macroagal Biorefinery (GENIALG- GENIALG/BPD/2017-059), in which have been developing several tools and techniques for macroalgal production.
Her main research interest are focus on algal biotechnology, namely in optimization of algal and metabolites production, extraction processes and bioactivities assessment.

Company info:
CIIMAR - Interdisciplinary Centre of Marine and Environmental Research - is a leading research and advanced training institution of the University of Porto, working at the frontier of Ocean Knowledge and Innovation.

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Abstract:
Light quality is a key factor affecting algal growth, morphogenesis, photosynthesis, and pigments production [1]. Light-emitting diodes (LEDs) have become an advanced and cost-effective technology in indoor algal production. Current studies only focus on physiological parameters such as growth rate and photosynthetic pigment synthesis separately [2], instead of integrating these and other parameters such as photosynthesis rate and

antioxidant capacity – desirable for industrial food applications. Our goal is to use light quality as a tool to modulate indoor production of *Ulva sp*. while increasing its bioactive potential.Firstly, the monochromatic effects of white (W), green (G), red (R) and blue (B) LEDs were tested, on growth (fresh weight and growth surface area), photosynthetic activity (PAM), pigments profile and production (HPLC-DAD determination), and antioxidant capacity ($ABTS^{+\bullet}$, $O_2^{\bullet-}$ and $^{\bullet}NO^{-}$ assays). Then, using the monochromatic LED that yielded the best results, the effect of an addition of far-red LED (FR) was studied.

Results revealed that no statistical differences were observed in highest growth under W, R and B. However, under G, *Ulva* sp. attained a quicker photosynthetic acclimation rate, and the highest content in pigments, which was reflected on its bioactivity, particularly on $ABTS^{+\bullet}$ assay. Also, *Ulva* sp. grown under R and W, seems to produce antioxidant compounds particularly against the radicals $O_2^{\bullet-}$ and $^{\bullet}NO^{-}$.
The addition of FR to W and G induced an improvement of photosynthetic acclimation rate, growth, and the production of antioxidant compounds against $O_2^{\bullet-}$radical, particularly in *Ulva* sp. cultivated under GRF.

Keywords: macroalgae, carotenoids, chlorophylls, photosynthesis chromatic acclimation

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