

Master thesis proposal in scope of the ALGAESOLUTIONS project
Universidade do Algarve
Academic Year: 2021-2022

Student	Name: Number: Email:
Title of Master Thesis	Flashing light for biocompound induction in algae
Scientific Area	Microalgal Biotechnology
Supervisor(s)	João Varela, Universidade do Algarve, Campus de Gambelas, jvarela@ualg.pt Peter Schulze, Associação Oceano Verde, Universidade do Algarve; peterschulze@greencolab.com
Location	Associação Oceano Verde Universidade do Algarve, Campus de Gambelas Edf. 12 - Gab. H8 8005-139 Faro, Portugal www.greencolab.com
Goals	<ul style="list-style-type: none"> • Investigate optimal flashing light conditions and light colours for target biocompound induction (e.g., pigments, fatty acids) in algae. • Investigate optimal exposure time to flashing light for the induction of target biocompounds in algae.
Abstract	<p>Background: In previous studies, frequencies lower or equal 50 Hz were found to induce pigments or PUFA in various algae. In addition to flashing light, also monochromatic light affects the physiological state of the culture and its biochemical composition. However, both types of light can also inhibit growth and, therefore, the optimal frequency, duty cycle and exposure duration are necessary to obtain the best target metabolite productivity. Previous studies have shown that the application of light to induce target metabolites is particularly promising when applied in a two-stage cultivation approach: First, algae are cultivated under lighting conditions promoting growth until the early exponential phase and only when cultures reach a threshold concentration the metabolite-inducing light treatment should be applied.</p> <p>Objective: This MSc thesis project will be part of the ALGAESOLUTIONS project and aims to develop strategies of using mono- and multichromatic flashing light for target biocompound induction in algae.</p> <p>Implementation: Self-made LED modules according to previous studies with monochromatic or multichromatic LEDs will be connected to a pulse width modulator to emit flashing light of different frequencies and duty cycles in a collaborative effort of GreenColab and UALG.</p> <p>Outlook: The developed knowledge will be used to design LED-based biomass induction systems for specific algae cultures.</p>

	<p>Who: You should be interested in microalgal biotechnology, photosynthesis, light, algae cultivation and designing/building of experimental setups. You should also have some lab experience. If you are interested to write your thesis on this topic, contact peterschulze@greencolab.com.</p> <p>References:</p> <ol style="list-style-type: none"> I. Lima, S., Schulze, P.S., Schüler, L.M., Rautenberger, R., Morales-Sánchez, D., Santos, T.F., Pereira, H., Varela, J.C., Scargiali, F., Wijffels, R.H. and Kiron, V., 2021. Flashing light emitting diodes (LEDs) induce proteins, polyunsaturated fatty acids and pigments in three microalgae. <i>Journal of Biotechnology</i>, 325, pp.15-24. II. Schulze, P.S., Barreira, L.A., Pereira, H.G., Perales, J.A. and Varela, J.C., 2014. Light emitting diodes (LEDs) applied to microalgal production. <i>Trends in biotechnology</i>, 32, pp.422-430. III. Schulze, P.S., Brindley, C., Fernández, J.M., Rautenberger, R., Pereira, H., Wijffels, R.H. and Kiron, V., 2020. Flashing light does not improve photosynthetic performance and growth of green microalgae. <i>Bioresource Technology Reports</i>, 9, p.100367.
Schedule	<p>Experimental start: November 2021 Experimental end: June 2022</p>