Effect of different application protocols of a static magnetic field of 47.23 mT in cultures of *Chlorella vulgaris*

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Microalgae are known for their many applications, including agriculture, aquaculture, animal and human food production, cosmetics, pharmaceuticals, and important environmental services such as the removal of heavy metals. Studies carried out to date in different countries conclude that a high consumption of energy, CO_2 and inorganic nutrients is still required for commercial cultivation, depending on the metabolites to be produced, which is still a problem in production on a large scale.

To achieve the increase of biomass production and production of metabolites of industrial interest in microalgae, different methods are developed and applied. Despite the existence and application of these methods, the costs of production have not yet been reduced, since the solutions used for this purpose do not yet allow obtaining large volumes of biomass with the least use of resources. That is why new alternative methods are being investigated for improving the performance of these microorganisms. One of these methods, still under study, is the application of the Static Magnetic Field (SMF) [1, 2]. In this research the effect of different SMF protocols in different phases of growth was evaluated; and its influence on growth, cellular viability and concentration of metabolites of industrial interest in microalgae.

In general, it is evident that the kinetics of the controls are different from the cultures exposed to the SMF, obtaining the highest values of maximum cellular concentration in those exposed to SMF during the early exponential phase (10 800 ± 123 x 10^4 cells. mL^{-1}), which were significantly higher than those obtained in cultures exposed to SMF in the late exponential phase (9 576 ± 207.5 x 10^4 cel.mL^{-1}) ($p \leq 0.05$), and with respect to the control (4 122 ± 112x 10^4 cel.mL^{-1}) ($p \leq 0.05$).

The results indicate that *C. vulgaris* normally accumulates more chlorophyll than carotenes. When applying the SMF applied in early exponential phase, the accumulation of chlorophyll and carotene is stimulated, so that the relation decreases with respect to the control ($p \leq 0.05$). This could be evidence of a response to stress, which could become a promising mechanism to stimulate lipid production.

In investigations developed by other authors with application of SMF in microalgae [3], it has been observed that the influence of this physical agent on the microorganisms depends on the magnetic field induction that is applied, as well as the time of exposure. Hence, magnetic treatment can be considered as a growth promoting agent, which can cause changes in the metabolism of microalgae.

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3. Deamici, K.M., et al., *Static magnetic fields in culture of Chlorella fusca: Bioeffects on growth and biomass composition.* Process Biochemistry, 2016. **51**(7): p. 912-916.