Microalgal cultivation on organic carbon sources

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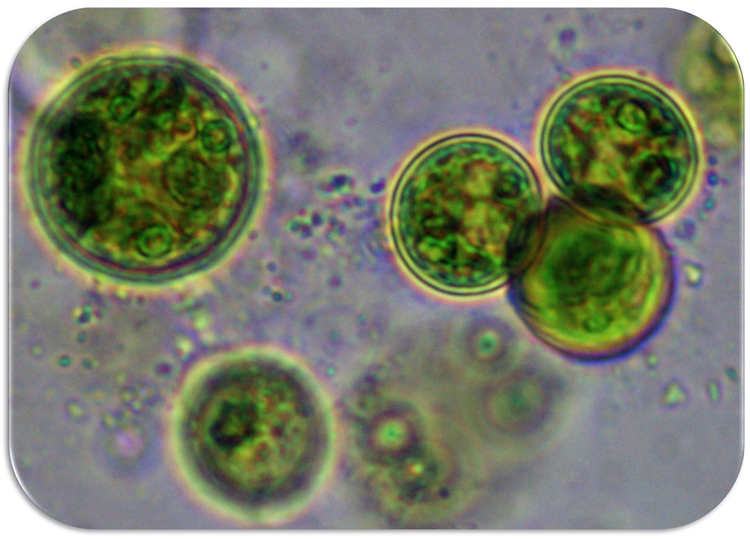
Microalgae are unicellular and photosynthetic microorganisms, with applications in various fields.

Human food and nutrition

Pharmaceutics

Materials and Biochemicals

Biofuels



Animal feed and aquaculture

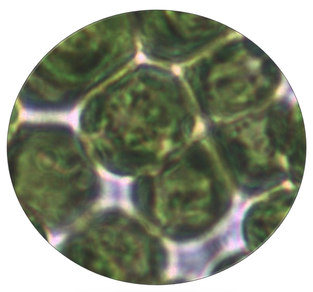
Cosmetics

Agriculture

Bioremediation

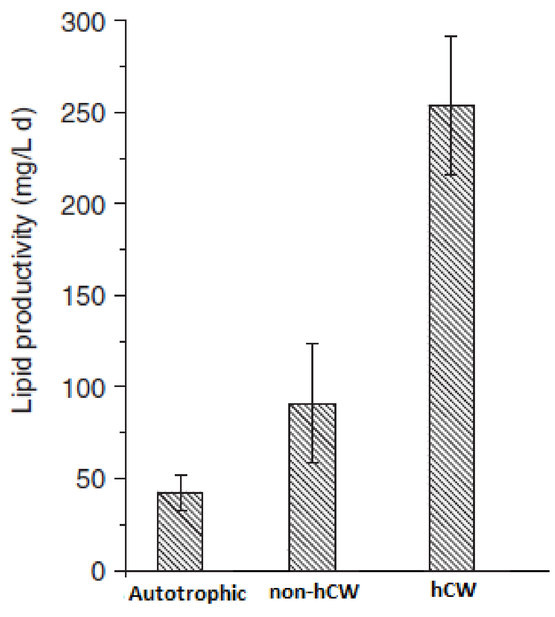
Despite being photosynthetic organisms, microalgae can grow in media supplemented with organic carbon, in the light (mixotrophy) or in the dark (heterotrophy), significantly increasing growth and biomass production when compared to CO_2-based growth (autotrophy).

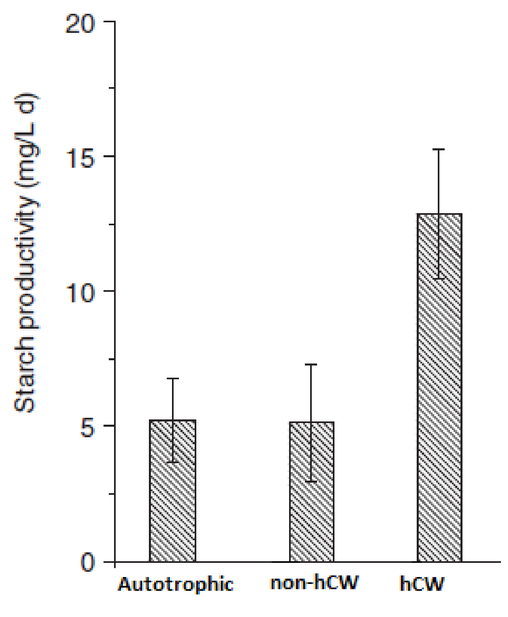
The heterotrophic biomass productivity of *Chlorella ellipsoidea* in glucose was 26.9 times higher than the autotrophic one (Han et al., 2012).

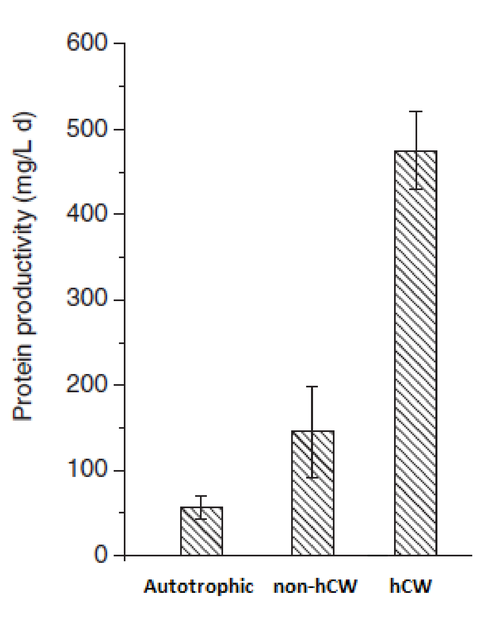


The mixotrophic biomass productivity of *Micractinium inermum* in glucose was 35.4 times higher than the autotrophic method (Smith et al., 2015).

The organic carbon sources must be supported by organic by-products, wastes and wastewaters. The mixotrophic cultivation of *Chlorella vulgaris* based on non-hydrolyzed (non-hCW; 10 g/L lactose) and hydrolyzed cheese whey (hCW; 5 g/L glucose + 5 g/L galactose) expressively improved biomass, lipids, starch and proteins productivities, compared to the autotrophic condition (Abreu et al., 2012).







Data adapted from Abreu et al. (2012).

Mixotrophic and heterotrophic cultivation of microalgae could be a feasible alternative to reduce production costs making possible its sustainable growth for several applications (food, feed and cosmetics) and, at the same time, serve as bioremediation systems and reduce the environmental footprint.

Funding: The authors acknowledge the financial support from Fundação para a Ciência e a Tecnologia (Lisbon, Portugal) through the R&D Unit Centre Bio (UID/ 05083/2020) and PhD Studentship (co-funded by BLC3) of Ana Paula Abreu (SFRH/BDE/100385/2014).

References: Abreu, A.P., Fernandes, B., Vicente, A.A., Teixeira, J., Dragone, G., 2012. Mixotrophic cultivation of *Chlorella vulgaris* using industrial dairy waste as organic carbon source. Bioresour. Technol. 118, 61–66// Han, F., Huang, J., Li, Y., Wang, W., Wang, J., Fan, J., Shen, G., 2012. Enhancement of microalgal biomass and lipid productivities by a model of photoautotrophic culture with heterotrophic cells as seed. Bioresour. Technol. 118, 431–437 // Smith, R.T., Bangert, K., Wilkinson, S.J., Gilmour, D.J., 2015. Synergistic carbon metabolism in a fast growing mixotrophic freshwater microalgal species *Micractinium inermum*. Biomass and Bioenergy 82, 73–86