

Title:

Urea as a strategy to advance an algal biomass industry

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Abstract:

Urea is the most widely used fertilizer in the world and a low-cost source of carbon and nitrogen that can be used for growth of microalgae. The objective of this work was to demonstrate the efficiency of the use of urea as carbon / nitrogen source in the growth of *Chlorella sorokiniana*.

The experiments were carried out using 250 ml Erlenmeyer flasks containing 150 ml medium, on an orbital shaker at 150 rpm with photoperiod of 16h / 8h, light intensity of $34 \mu\text{mol m}^{-2} \text{s}^{-1}$ at $25 \pm 0.5 \text{ }^\circ\text{C}$ for 7 days.

Growth in three media described in the literature (Bold Basal, BG11 and NitrU) was compared and we observed that use of the BG11 medium led to a larger number of cells while NitrU medium permitted more biomass production.

Based on this experiment BG11 was chosen as the standard medium, and new cultures were carried out by exchanging the nitrogen source of sodium nitrate for urea (BGU).

Urea is transported into the cell and hydrolyzed by urea carboxylase and allophanate hydrolase to generate ammonium and carbon dioxide. In algal cultures where urea was used as a source of nitrogen equal or greater levels of compounds of interest were detected. The polyunsaturated fatty acids (18-2 and 18-3) also accumulated to greater extent in these cultures with urea, indicating a higher availability of CO_2 .

In conclusion, the use of urea as a source of nitrogen together with the optimization of algal production through biotechnological tools including evolutionary adaptation techniques may lead to significant advancement of the algal biomass industry.