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CARBON DIOXIDE FROM ALCOHOLIC FERMENTATION AS A CARBON SOURCE FOR FED-BATCH CULTIVATION OF *Arthrospira platensis*

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Abstract

World's production of ethanol has increased dramatically in recent years. Brazil is the world's largest exporter of bioethanol and second-largest producer after the United States. Considering the increasing demand for this fuel and the fact that alcoholic fermentation is responsible for a CO_2 release, on weight basis, almost coincident with ethanol production, it would be interesting to develop a process for CO_2 fixation able to turn it into a useful product. Photosynthetic microorganisms can fix CO_2 efficiently producing biomass that contains high-value bioactive products and may provide a very promising alternative for the current CO_2 mitigation strategies. Nowadays, there are numerous commercial applications of *Arthrospira platensis* biomass such as the enhancement of the nutritional value of foods and animal feed, bioremediation, and use in cosmetics. The objective of this work was to evaluate the *Arthrospira platensis* cultivation using CO_2 from alcoholic fermentation and either urea or nitrate as nitrogen source at different light intensities ($60 \leq I \leq 240$ μmol photons m^{-2} s^{-1}). The CO_2 source (pure CO_2 or from alcoholic fermentation) did not influence the maximum cell concentration (X_m), cell productivity (P_X) and nitrogen-to-cell conversion factor ($Y_{X/N}$). On the other hand, the use of urea instead of nitrate led to higher $Y_{X/N}$ values. X_m and P_X increased when I was increased from 60 to 120-240 μmol photons m^{-2} s^{-1}. Using CO_2 from alcoholic fermentation, the best performance (X_m=2952 ± 35 mg L^{-1}, P_X=425±5.9 mg L^{-1} d^{-1} and $Y_{X/N}$=15±0.20 mg mg^{-1}) was obtained at I = 120 μmol photons m^{-2} s^{-1} with urea. The results obtained in this work demonstrate that urea and CO_2 from alcoholic fermentation could be simultaneously used in large-scale cultivations to reduce the environmental impact associated to the release of this greenhouse gas as well as to decrease the production cost of this cyanobacterium.