INCREASING LUTEIN CONCENTRATION IN A CHLORELLA STRAIN BY CHANGING THE GROWING PARAMETERS AND TESTING ITS ANTICANCER POTENTIAL

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Résumé

Lutein is a key carotenoid produced by plant cells which exhibits anticancerogenic, anti-inflammatory, and antioxidant properties. Microalgae, a promising lutein source, show high productivity which may be influenced by applying different culture conditions or stress during cultivation. For instance, low illumination conditions and high nitrogen concentrations generally enhance lutein production, along with high temperatures.

In this work, an indigenous sicilian strain of microalgae was molecularly identified as Chlorella-like strain. It was studied for its ability to accumulate lutein under various cultivation conditions. Four key parameters were adjusted: light intensity (ranging from 100 to 400 μmol m-2 s-1), nitrate concentration (from 0.1 g L-1 to 6 g L-1), phosphate concentration (from 0.01 to 0.3 g L- 1), and salinity as NaCl concentration (ranging from 0 to 42.5 g L-1). Following the identification of the optimal conditions for maximizing lutein productivity using a Design of Experiment (DOE) approach, three conditions were selected: MAX (Maximize lutein content), MAX 2 (Maximize lutein concentration in the broth), MIN (Minimize lutein). These conditions were applied to a scaled-up culture of 2.5 L cultures to obtain a lutein concentration of 2.153± 0.212 ug/mg biomass, 1.697± 0.165 ug/mg biomass and 0.679 ± 0.0947 ug/mg biomass, respectively.

The crude methanolic extracts of the obtained microalgal cultures were tested on cancer cell lines, revealing a dosage-dependent antiproliferative effect on melanoma A2058 cells. The extracts' fractions containing lutein exhibited similar effects, likely due to a concerted action of multiple substances, with lutein being one of the main contributors.

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