**DESIGNING THE NITROGEN SUPPLY STRATEGY IN *MONORAPHIDIUM* SP. CULTURES IN A PHOTOBIOREACTOR FOR OPTIMAL PRODUCTIVITY AND MACRONUTRIENTS SYNTHESIS**

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**ABSTRACT**

Recently, the European Union has posed microalgae as a pillar for developing the Bioeconomy sector in Europe, promoting microalgae-based products as a sustainable source of nutrient ingredients for human and animal consumption [1]. Nitrogen plays a pivotal role in microalgae cultures, affecting their growth and intracellular synthesis of proteins, lipids, and carbohydrates [2,3]. Although the effect of the nitrogen source and its initial concentration in the growth medium has been extensively studied, the impact of different nitrogen addition policies on microalgae biomass during fed-batch cultivation experiments is scarcely evaluated. Thus, in this research, a set of four diagnostic 15-day cultivation experiments of *Monoraphidium* sp. was performed in a lab-scale photobioreactor with 3L working volume to evaluate the effect of nitrogen feeding strategies on the biomass productivity as well as at the synthesis of macronutrients (proteins, lipids, carbohydrates) and pigments (chlorophyll a and b and carotenoids). The four applied strategies included: **(a)** initial loading of 300 mg NaNO3/L in the growth medium, **(b)** fed-batch daily supply of NaNO3 up to a total amount of 300 mg NaNO3/L, **(c)** initial loading of 750 mg NaNO3/L in the growth medium, and **(d)** fed-batch daily supply of NaNO3 up to a total amount of 750 mg NaNO3/L. The cultures were incubated at 25ο C with continuous aeration of 0.2 L /min and provision of CO2 at a flow rate of 2.5 mL/min, while the pH was maintained within the range of 7± 0.5 through an automated addition of buffer solutions of NaOH and HCl. All cultures were seeded with 100± 10% mg/L (on a dry-biomass base) of cells, and the applied photo-period was 16 h light followed by 8 h of darkness. Gradually increased illumination and agitation profiles were adopted in all experiments. The cultures were dynamically monitored (twice daily) with respect to the following parameters: OD(750, 655 &550nm), pigments concentration, number, morphological and morphometric characteristics of cells, and nitrogen concentration, while every 48h culture’s samples were collected for the determination of biomass content and dry weight. Results indicate a significant impact of the nitrogen supply policy on the quantity and quality of microalgae biomass production, showcasing different cultivation strategies accordingly to the targeting macronutrient.

**KEYWORDS: Fed-batch operation, Photobioreactor, Nitrogen feeding, Microalgae, *Monoraphidium***

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