

The Innovative Engineered Reactor To Quantitative Optimization of *Spirulina* Biomass

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Special properties and various applications of *Spirulina* species have led to the growing focus of biotechnology to the cost effective cultivation. Open ponds used in the most commercial cultivation have many deficiencies such as risk of contamination, lack of light penetration, inefficient mixing and low productivity. In this study, an innovative reactor was designed and manufactured. By adding a control area, it was possible to control some environmental conditions for a limited amount of open pond volume. The conventional pumping system was replaced by a new elevator system to reduce the damage of to the fragile cells. The baffles structure and aeration from bottom, contributed to better mixing system. The effect of three factors (Circulation Cycle (Cir. Cyc.), Control Volume (Con.Vol.) and Irradiance Intensity (Irr. Int.) in units of hours, percentage and lux respective on the quantity of biomass (Specific Growth Rate (SGR, day⁻¹) and fifth and seventh day dry weight (g/L)) were evaluated using RSM-CCD. The maximum biomass dry weight (0.915 g/L) was achieved in longest circulation cycle (12 hours). The optimal irradiance intensity to achieve the highest biomass was 8700 Lux. According to the results, it is possible to increase the productivity and enhance the culture dry weight by controlling a limited amount of ponds volume (20%), subject to economic considerations. These successful results can provide the context using a control zone for several open ponds to improve the overall efficiency.

Keywords. Specific growth rate, *Spirulina*, biomass, bioreactor, RSM-CCD