
Prototipe Kolom Gelembung Budidaya *Chlorella vulgaris* Buitenzorg dengan Metode Pengaturan Kerapatan Flux Cahaya

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Cultivation of *Chlorella vulgaris* Buitenzorg in a pilot scale of bubble column photo bioreactor with photon flux density (PFD) alteration in this research was successfully enhanced the biomass production until around two and half times compared with the constant light illumination at $77.4 \mu\text{mol}/(\text{m}^2 \cdot \text{s})$ [5.0 klx]. The enhancing growth of this micro alga was happened during a shorter cultivation period that was around 60-65 % time allocation of growth period. Cultivation using filter unit in both of alteration mode and constant illumination also showed a more efficient result than the constant photon flux density without filter unit at $77.4 \mu\text{mol}/(\text{m}^2 \cdot \text{s})$, it was almost two and half times. Using filter unit, the difference of PFD alteration and constant illumination in cellular population growth was only 32%. The presence of propane and butane in sparged air (around 0.5%) give a positive effect on micro alga growth and the difference in both of cultivation mode was only 60%. Both cultivations used specific operation conditions, such as: $T = 302 \text{ K}$, $P = 101 \text{ KPa}$., superficial gas velocity (U_G) = 15 m/h, CO_2 content in sparged air ($y_{\text{CO}_2,i}$) = 10%; Beneck medium; 20 dm^3 volume of bubble column photo bioreactor; and photon flux density source by Phillip Halogen Lamp 20W /12V/ 50Hz.