

INTISARI

Peningkatan emisi karbon dioksida (CO₂) mendorong pengembangan metode penangkapan karbon yang berkelanjutan, salah satunya melalui pemanfaatan mikroalga. Penelitian ini bertujuan untuk mengevaluasi pengaruh suhu dan pH terhadap pertumbuhan biomassa serta kinetika pertumbuhan *Euglena gracilis* pada sistem kultur batch tanpa aerasi. Kultivasi dilakukan dalam Erlenmeyer 250 mL dengan pencahayaan LED kontinu sebesar 2.000 lux selama 26 hari. Variasi suhu yang digunakan adalah 27, 30, dan 40 °C, sedangkan pH awal media divariasikan pada pH = 4, pH = 7, dan pH = 9.

Pertumbuhan biomassa dipantau melalui pengukuran *optical density* pada panjang gelombang 680 nm (OD₆₈₀) yang dikonversi menjadi konsentrasi biomassa. Dinamika substrat karbon anorganik diestimasi berdasarkan data pH dan *alkalinity* media selama kultivasi. Analisis kinetika dilakukan menggunakan model berbasis persamaan diferensial untuk menggambarkan dinamika pertumbuhan biomassa dan substrat.

Hasil penelitian menunjukkan bahwa suhu 40 °C dan pH = 9 secara konsisten menyebabkan penurunan biomassa *Euglena gracilis*, sedangkan pertumbuhan terbaik diperoleh pada kombinasi pH = 4 suhu 27 °C dan pH = 7 suhu 30 °C. Dinamika substrat karbon anorganik tidak menunjukkan pola konsumsi bersih yang konsisten, karena konsentrasi substrat berfluktuasi sebagai respons terhadap pertumbuhan dan penurunan biomassa; sehingga pengaruh suhu dan pH lebih jelas tercermin pada perubahan biomassa daripada dalam dinamika substrat. Pemodelan kinetika menunjukkan bahwa Model Contois mampu merepresentasikan dinamika pertumbuhan biomassa dengan lebih baik dibandingkan Model Haldane, meskipun kedua model memiliki keterbatasan dalam menggambarkan dinamika substrat.

Kata kunci: *Euglena gracilis*, penangkapan CO₂, kultur tanpa aerasi, kinetika pertumbuhan, suhu, pH.

ABSTRACT

*The increasing emission of carbon dioxide (CO₂) has driven the development of sustainable carbon capture methods, one of which involves the utilization of microalgae. This study aimed to evaluate the effects of temperature and pH on biomass growth and growth kinetics of *Euglena gracilis* in a non-aerated batch culture system. Cultivation was conducted in 250 mL Erlenmeyer flasks under continuous LED illumination at an intensity of 2,000 lux for 26 days. The temperature conditions investigated were 27, 30, and 40 °C, while the initial pH values of the medium were set at pH = 4, pH = 7, and pH = 9.*

Biomass growth was monitored by measuring optical density at a wavelength of 680 nm (OD₆₈₀), which was converted into biomass concentration. The dynamics of inorganic carbon substrate were estimated based on pH and alkalinity data of the culture medium during cultivation. Kinetic analysis was performed using differential equation-based models to describe the dynamics of biomass growth and substrate.

*The results showed that a temperature of 40 °C and pH = 9 consistently caused a decrease in *Euglena gracilis* biomass, whereas the highest biomass growth was obtained at pH = 4 and 27 °C, and at pH = 7 and 30 °C. The dynamics of inorganic carbon substrate did not exhibit a consistent net consumption pattern, as substrate concentrations fluctuated in response to biomass growth and decline; therefore, the effects of temperature and pH were more clearly reflected in biomass changes than in substrate dynamics. Kinetic modeling demonstrated that the Contois model represented biomass growth dynamics more accurately than the Haldane model, although both models exhibited limitations in describing substrate dynamics.*

Keywords: *Euglena gracilis*, CO₂ capture, non-aerated culture, growth kinetics, temperature, pH.