

**PENGARUH VARIASI pH TERHADAP LAJU PERTUMBUHAN,  
BIOMASSA, KANDUNGAN METABOLIT,  
DAN PIGMEN *Euglena* sp.**

**Istini Nurafifah**

**21/475892/PBI/01760**

**INTISARI**

*Euglena* sp. merupakan salah satu spesies mikroalga dari filum Euglenozoa, hidup di air tawar dan berada di area terbuka di bawah sinar matahari. Potensi *Euglena* sp. sebagai bahan fungsional inovatif dalam industri makanan, pakan dan obat-obatan serta kosmetik berkaitan dengan keberadaan metabolit yang terdapat di *Euglena* sp. Biomassa *Euglena* sp. mengandung karbohidrat, protein, lipid, serta pigmen yaitu klorofil a dan b serta karotenoid seperti xanthophyll, astaxanthin, zeaxanthin, karoten, dan betakaroten. *Euglena* sp. merupakan mikroalga yang cenderung hidup pada pH asam. Tujuan dari penelitian ini yaitu untuk mengetahui pengaruh variasi pH terhadap laju pertumbuhan, produksi biomassa, kandungan karbohidrat, lipid, protein, dan produksi klorofil a, klorofil b, karotenoid, astaxanthin serta turunan karotenoid pada *Euglena* sp. Variasi pH yang digunakan penelitian ini antara lain 2.5, 3.5, dan 4.5. Laju pertumbuhan diukur setiap hari dengan parameter *Optical Density* (OD), densitas sel dan biomassa. Kandungan metabolit diukur 3 hari sekali, antara lain protein dengan metode Bradford, lipid dengan metode Bligh & Dryer, karbohidrat dengan metode Fenol Asam Sulfat dan pigmen seperti klorofil, karotenoid, astaxanthin dan turunan karotenoid dengan metode spektrofotometri. Hasil penelitian dianalisis dengan laju pertumbuhan, biomassa, densitas sel, kandungan karbohidrat, lipid, protein, klorofil a, klorofil b, astaxanthin dan total karotenoid serta turunan karotenoid menggunakan Analisis varian (ANOVA) dan uji lanjut Duncan. Hasil penelitian menunjukkan bahwa perlakuan pH 3.5 menghasilkan tingkat pertumbuhan terbaik, biomassa, karbohidrat, protein, serta lipid terbanyak. Biomassa, karbohidrat, protein, dan lipid pada perlakuan pH 3.5 berturut-turut sebesar  $1.600 \pm 0.229$  g/L,  $2.837 \pm 0.270$  g/g,  $0.673 \pm 0.128$  ( $\times 10^{-3}$  g/g), dan  $0.140 \pm 0.040$  ( $\times 10^{-2}$  g/g). Sementara itu, produksi klorofil dan total karotenoid, astaxanthin, dan turunan karotenoid tertinggi ditemukan pada pH 4.5 yaitu produksi klorofil a; produksi klorofil b; karotenoid total; dan astaxanthin berturut-turut sebesar  $1.373 \pm 0.584$  ( $\times 10^{-3}$  g/g);  $0.750 \pm 0.094$  ( $\times 10^{-3}$  g/g);  $0.280 \pm 0.109$  ( $\times 10^{-3}$  g/g); dan  $1.270 \pm 0.567$  ( $\times 10^{-3}$  g/g). Selain itu, terdapat 10 jenis turunan karotenoid dengan nilai tertinggi terdapat pada pH 4.5.

Kata kunci: pH asam, biomassa, *Euglena* sp., metabolit, pigmen

## EFFECTS OF pH VARIATION ON THE GROWTH RATE, BIOMASS, METABOLITES, AND PIGMENT CONTENTS OF *Euglena* sp.

**Istini Nurafifah**

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### ABSTRACT

*Euglena* sp. is one of the microalgae species of the phylum Euglenozoa, lives in freshwater, and is in an open area in the sun. Potential *Euglena* sp. as an innovative functional ingredient in the food, feed, pharmaceutical, and cosmetic industries related to the presence of metabolites in *Euglena* sp. Biomass *Euglena* sp. contains carbohydrates, proteins, lipids, pigments, chlorophyll a and b, and carotenoids such as xanthophyll, astaxanthin, zeaxanthin, carotene, and beta-carotene. *Euglena* sp. is microalgae that tend to live at acidic pH. This study aimed to determine the effect of pH variations on the growth rate, biomass production, carbohydrate content, lipids, proteins, and the production of chlorophyll a, chlorophyll b, carotenoids, astaxanthin, and carotenoid derivatives in *Euglena* sp. The pH variations used in this study include 2.5, 3.5, and 4.5. The growth rate is measured daily with Optical Density (OD), cell density, and biomass parameters. In addition, metabolite content is measured every three days, including proteins with the Bradford method, lipids with the Bligh & Dryer method, carbohydrates with the Phenol Sulfuric Acid method, and pigments such as chlorophyll, carotenoids, astaxanthin, and carotenoid derivatives by the spectrophotometric method. The study's results were analyzed by testing growth rate, biomass, cell density, carbohydrate, proteins, lipids, chlorophyll a, chlorophyll b, astaxanthin, and total carotenoids and carotenoid derivatives using analysis of variance (ANOVA) and Duncan further test. The results showed that pH 3.5 treatment has the highest growth rate, biomass, carbohydrates, proteins, and lipids. Biomass, carbohydrates, proteins, and lipids at pH 3.5 treatment were  $1.600 \pm 0.229$  g/L,  $2.837 \pm 0.270$  g/g,  $0.673 \pm 0.128$  ( $\times 10^{-3}$  g/g), and  $0.140 \pm 0.040$  ( $\times 10^{-2}$  g/g). Meanwhile, chlorophyll production and total carotenoids, astaxanthin, and carotenoid derivatives, the highest was found at pH 4.5, namely chlorophyll a; chlorophyll b; total carotenoids; and astaxanthin respectively are  $1.373 \pm 0.584$  ( $\times 10^{-3}$  g/g),  $0.750 \pm 0.094$  ( $\times 10^{-3}$  g/g);  $0.280 \pm 0.109$  ( $\times 10^{-3}$  g/g); dan  $1.270 \pm 0.567$  ( $\times 10^{-3}$  g/g). In addition, there were 10 types of carotenoid derivatives with the highest result found in the pH 4.5 treatment.

Keywords: acidic pH, biomass, *Euglena* sp., metabolites, pigment