

Effect of Mg²⁺ and Fe²⁺ Concentrations in Culture Medium on CGF Formation from Microalgae Chlorella pyrenoidosa Ink and Analysis of Amino Acids by Liquid Chromatography-Mass Spectrometry

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Abstrak

Pengaruh Konsentrasi Mg²⁺ dan Fe²⁺ dalam Media Kultur terhadap Pembentukan CGF oleh Mikroalga Chlorella pyrenoidosa INK dan Analisis Asam Amino dengan Kromatografi Cair-Spektrofotometri Massa. Chlorella pyrenoidosa (*C. pyrenoidosa*) mengandung Chlorella Growth Factor (CGF), yang terdiri dari protein dan polisakarida. CGF terletak di dalam inti sel dan bermanfaat bagi manusia sebagai suplemen makanan, booster imunitas, dan antioksidan. Pembentukan CGF oleh *C. pyrenoidosa* dipengaruhi oleh komposisi medium. *C. pyrenoidosa* INK dikultur dalam media basal dimodifikasi (MBM) dengan berbagai konsentrasi Mg²⁺ (0,5, 1,0, dan 1,5 g/L) dan Fe²⁺ ($3,5 \times 10^{-4}$ dan $5,0 \times 10^{-4}$ g/L). Percobaan dilakukan menggunakan rancangan acak lengkap dalam botol 2L dengan tiga kali pengulangan. Hasil penelitian menunjukkan bahwa MBM mengandung Mg²⁺ 1.0 g/L dan Fe²⁺ $3,5 \times 10^{-4}$ g/L menghasilkan kurva pertumbuhan *C. pyrenoidosa* yang optimal. Analisis kandungan protein dilakukan dengan metode Lowry menggunakan spektrofotometer pada $\lambda = 750$ nm, menghasilkan 0,0974 mg/mL (ekstrak) dan 6,4097 mg/mL (supernatan). Selanjutnya, analisis kadar glukosa dilakukan dengan metode fenol sulfat ($\lambda = 490$ nm), hasil yang diperoleh 49,331 ppm (ekstrak) dan 1566,911 ppm (supernatan). Analisis asam amino dalam CGF menggunakan spektrometri massa kromatografi cair (KC-SM) menunjukkan adanya tirosin, prolin, asam glutamat, alanin, valin, triptopan, fenilalanin, metionin, dan leusin-isoleusin.

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Chlorella pyrenoidosa (*C. pyrenoidosa*) contains Chlorella Growth Factor (CGF), which consists of protein and polysaccharides. CGF is located inside the nucleus of cells and is beneficial to humans as a food supplement, an immunity booster, and an antioxidant. CGF formation of *C. pyrenoidosa* is influenced by medium composition. *C. pyrenoidosa* INK was cultured in a modified basal medium (MBM) with various concentrations of Mg²⁺ (0.5, 1.0, and 1.5 g/L) and Fe²⁺ (3.5×10^{-4} and 5.0×10^{-4} g/L). The experiments were run and analyzed under a completely randomized design using a 2-L bottle with three replications. The results showed that MBM with 1.0 g/L of Mg²⁺ and 3.5×10^{-4} g/L of Fe²⁺ yielded the optimal growth curve for *C. pyrenoidosa*. Analysis of protein content was carried out using the Lowry method with a spectrophotometer at $\lambda = 750$ nm, and the obtained results were 0.0974 mg/mL (extract) and 6.4097 mg/ml (supernatant). Furthermore, analysis of glucose content was carried out using the phenol sulfate method ($\lambda = 490$ nm), and the obtained results were 49.331 ppm (extract) and 1566.911 ppm (supernatant). Analysis of amino acids in CGF using liquid chromatography-mass spectrometry (LC-MS) indicated the presence of tyrosine, proline, glutamate, alanine, valine, tryptophan, phenylalanine, methionine, and leucine-isoleucine.