

## Effect of Mg<sup>2+</sup> and Fe<sup>2+</sup> 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

*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 Mg<sup>2+</sup> (0.5, 1.0, and 1.5 g/L) and Fe<sup>2+</sup> (3.5×10<sup>-4</sup> and 5.0×10<sup>-4</sup> 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 Mg<sup>2+</sup> and 3.5×10<sup>-4</sup> g/L of Fe<sup>2+</sup> yielded the optimal growth curve for *C. pyrenoidosa*. Analysis of protein content was carried out using the Lowry method with a spectrophotometer at λ=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 (λ=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.

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Pengaruh Konsentrasi Mg<sup>2+</sup> dan Fe<sup>2+</sup> 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 Mg<sup>2+</sup> (0,5, 1,0, dan 1,5 g/L) dan Fe<sup>2+</sup> (3,5×10<sup>-4</sup> dan 5,0×10<sup>-4</sup> g/L). Percobaan dilakukan menggunakan rancangan acak lengkap dalam botol 2L dengan tiga kali pengulangan.

Hasil penelitian menunjukkan bahwa MBM mengandung Mg<sup>2+</sup> 1.0 g/L dan Fe<sup>2+</sup> 3.5×10<sup>-4</sup> g/L menghasilkan kurva pertumbuhan *C. pyrenoidosa* yang optimal. Analisis kandungan protein dilakukan dengan metode Lowry menggunakan spektrofotometer pada λ=750 nm, menghasilkan 0,0974 mg/mL (ekstrak) dan 6,4097 mg/mL (supernatan). Selanjutnya, analisis kadar glukosa dilakukan dengan metode fenol sulfat (λ=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.