Pengaruh konfigurasi reaktor terhadap produksi biomassa spirulina platensis dengan perlakuan pencahayaan kontinu

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Abstrak

Spirulina platensis adalah mikroalga hijau-biru yang berfotosintesis menghasilkan kultur biomassa yang komersil. Spirulina terkenal akan kandungan protein (60-74%(w/w) dan pigmen fikosianin (pigmen hijau biru). Kandungan biologis yang dimilkinya membuat ia spesial dijadikan suplemen makanan, anti-inflammatory untuk manusia atau dipakai sebagai pewarna alami di industri farmasi, terlebih lagi kemampuannya yang dapat memfiksasi kadar CO2 di atmosfir.
Pada penelitian kali ini Spirulina platensis akan dikultivasi dalam medium Conwy pada pencahayaan konstan sebesar 500 lx. Pencahayaan secara konstan ini dilakukan dengan sistem tertutup menggunakan fotobioreaktor, dimana penelitian ini bertujuan untuk melihat pengaruh konfigurasi reaktor susun seri (3 buah) terhadap produksi biomassa Spirulina platensis. Sebagai perbandingan dilakukan pula kultivasi Spirulina platensis pada reaktor tunggal dengan volume yang ekuivalen (1500 ml) dan kondisi operasi yang sama yakni Ug = 1,2 m/h, aliran gas CO2 3%(v/v) udara, tekanan 1 atm, dan temperatur ruang.
Hasil akhir yang dicapai pada penelitian ini adalah peningkatan jumlah produksi biomassa yang dihasilkan pada reaktor susun seri 1.31 kali lipat dibanding reaktor tunggal. Peningkatan ini disertai dengan peningkatan pH kultur, Konsentrasi [HCO3-] dan laju pertumbuhan spesifik (). Konsumsi energi Spirulina platensis pada reaktor susun seri untuk produksi biomassany mengalami kenaikan sebesar 3-5 kali lipat dibanding reaktor tunggal. Model Ierusalimsky digunakan untuk menggambarkan kinetika reaksi penyerapan substrat non-kompetitif dengan nilai laju pertumbuhan maksimum (max) 0.058-0.077 h-1, konstanta penjenuhan substrat (KS) -1.9 sampai -0.72, dan konstanta inhibisi (KI) 16.772 sampai 33.2.
<hr><i>Spirulina platensis is a marine microalga photoautotropic whose cultivation is particularly attractive for several commercial purposes. Its main interest is centered in its high protein content, 60?74% on a dry weight basis and phycocyanin pigment. It can be used either as anti-inflammatory, nutritional supplement for humans and animals or as source of active principles in pharmaceutical, cosmetic industries moreover fixation CO2 in atmosphere.
The study attemps to investigate the effects of configuration reactor in order to increasing Spirulina platensis biomass yield. Conwy medium was used for the batch culture in auto claved sea water. This experiment, light was adjust to 500 lx, superficial velocity of air was adjust to 1,2 m/h, and concentration of carbondioxide as source carbon was adjust to 3%(v/v) of air stream. At the beginning cultivation, inoculum was started from 4.000.000 cell/cm3. System photobioreactor respectively using reactor in 3 series with 500 mL in each reactor and it was compared with single reactor at equivalen total volume.
The specific growth rate and biomass production S.platensis at 3 series reactor achieved in this present experiment are higher than the single reactor. The series effect was also increasing levels of medium substrat, higher pH medium and energy consumption. At the end of this experiment (after 87 hour of culture), 3 series reactor resulted 1.31 increase times in biomass production which is energy consumption increasingly three to five times rather than single reactor. For pilot scale purposes, this experiment was also

studied to predict the kinetic reaction models of substrat absorption in S.platensis cell. A number of kinetic models were constructed to see the conjunction of growth rate and concentration substrat in S.platensis cell while producing biomass. Finally, Ierusalimsky equation was significantly resulted growth rate calculation data closer to the experimental data with constant substrat saturation value (KS) was -1.9 to -0.72, and constant inhibition (KI) 16.772 to 33.2.</i>