

Optimasi Multiobjektif Terhadap Pertumbuhan Populasi Synechococcus HS-9 pada Rectangular Airlift Photobioreactor menggunakan Artificial Neural Network = Multiobjective Optimization of Synechococcus HS-9 Population Growth in Rectangular Airlift Photobioreactor using Artificial Neural Network

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Abstrak

Penelitian mengenai optimasi multiobjektif terhadap pertumbuhan populasi Synechococcus HS-9 telah dilakukan. Pada penelitian digunakan Synechococcus HS-9 yang merupakan koleksi dari Laboratorium Taksonomi Tumbuhan Departemen Biologi FMIPA UI, Depok. Penelitian bertujuan untuk mengetahui hasil simulasi hidrodinamika Synechococcus HS-9 pada program Computational Fluid Dynamics (CFD) dan mengetahui kondisi hidrodinamika yang optimum untuk pertumbuhan Synechococcus HS-9. Penelitian dilakukan dengan mensimulasikan photobioreactor dengan menggunakan program CFD. Penelitian juga melakukan optimasi untuk mengetahui kondisi optimum untuk pertumbuhan Synechococcus HS-9 menggunakan Artificial Neural Network (ANN). Hasil penelitian menunjukkan kondisi optimum untuk pertumbuhan Synechococcus HS-9 dicapai dengan kondisi, yaitu suhu (T) sebesar 30,30C; derajat keasaman (pH) sebesar 9,4; Dissolved oxygen (DO) sebesar 1,4 mg/l, oxidation reduction potential (ORP) sebesar 34,7 mV; intensitas cahaya (I) sebesar 291,2 $\mu\text{mol m}^{-2}\text{s}^{-1}$; turbulence eddy dissipation (TED) sebesar 0,00135 m^2s^{-2} ; dan turbulence kinetic energy (TKE) sebesar 0,000238 m^2s^{-2} .

.....Research on the Multiobjective Optimization of Synechococcus HS-9 Population Growth using Artificial Neural Network has been carried out. Research using Synechococcus HS-9, which is the collection of the Plant Taxonomy Laboratory, FMIPA UI, Depok. This research purposes are to find out the results of the hydrodynamic simulation of Synechococcus HS-9 in the Computational Fluid Dynamics (CFD) and to find out the optimum hydrodynamic conditions for the growth of Synechococcus HS-9. The research was conducted by simulating a photobioreactor using CFD program. The study also carried out optimization to determine the optimum conditions for the growth of Synechococcus HS-9 using Artificial Neural Network (ANN). The results showed that the optimum conditions for the growth of Synechococcus HS-9 were achieved with the following conditions, i.e. Temperature (T) of 30.3 0C, acidity (pH) 9.4, dissolved oxygen (DO) 1.4 mg/l, oxidation reduction potential (ORP) sebesar 34.7 mV, intensity (I) 291.2 $\mu\text{mol m}^{-2}\text{s}^{-1}$, turbulence eddy dissipation (TED) 0.00135 m^2s^{-2} and turbulence kinetic energy (TKE) 0.00023872 m^2s^{-2} .