

**Nurbani Fatmalia, 2015, Optimalisasi Biodegradasi Senyawa Hidrokarbon dalam Oil Sludge oleh Acinetobacter sp. P2(1), TESIS ini dibawah bimbingan Dr. Ni'matuzahroh dan Dr. rer. nat. Ganden S. M.Sc., Departemen Biologi dan Departemen Kimia, Fakultas Sains dan Teknologi, Universitas Airlangga, Surabaya.**

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## ABSTRAK

Penelitian ini bertujuan untuk mengetahui respon pertumbuhan, dan persentase degradasi senyawa hidrokarbon *oil sludge* oleh *Acinetobacter* sp. P2(1). Ada dua tahapan dalam penelitian ini, tahap pertama adalah uji *screening* pertumbuhan dan kemampuan biodegradasi *Acinetobacter* sp. P2(1). terhadap empat jenis substrat uji, yaitu heksadekana, toluena, naftalena, dan fenantrena. Tahap kedua adalah uji optimalisasi biodegradasi *oil sludge Acinetobacter* sp. P2(1). Pada tahap kedua ini optimalisasi biodegradasi *oil sludge* dilakukan dengan penambahan molase konsentrasi 0,1,2, dan 3%. Penelitian ini bersifat eksperimental laboratoris yang menggunakan rancangan acak lengkap, dua ulangan, dengan pola faktorial pada masing-masing tahap penelitian. Untuk respon pertumbuhan dipantau dengan pengamatan TPC (*Total Plate Count*) dan pH akhir, sedangkan untuk persentase biodegradasi dianalisis menggunakan metode gravimetri dan kadar residu hidrokarbon dianalisis menggunakan GC-MS. Pada tahap Optimalisasi biodegradasi *oil sludge* dengan penambahan molase dilakukan pengukuran Aktivitas Emulsifikasi (AE) untuk memantau produksi biosurfaktan. Data TPC (*Total Plate Count*) dan perhitungan persentase biodegradasi yang dianalisis dengan menggunakan metode gravimetri dianalisis secara statistik menggunakan *One-way ANOVA* dengan uji Duncan dan Games Howell ( $p=0,05$ ). Hasil penelitian menunjukkan bahwa *Acinetobacter* sp. P2(1) dapat menggunakan substrat hidrokarbon sebagai sumber nutrisi pertumbuhannya. Berdasarkan analisis GC-MS diketahui bahwa *Acinetobacter* sp. P2(1) memiliki kemampuan mendegradasi senyawa heksadekana sebesar 42,857%, toluena 100%, fenantrena 76,154%, naftalena 80,631% pada konsentrasi 100 ppm. Molase yang ditambahkan pada substrat *oil sludge* terbukti berpengaruh terhadap potensi biodegradasi *Acinetobacter* sp. P2(1). Molase berperan sebagai kometabolisme dalam produksi biosurfaktan yang dapat meningkatkan persentase biodegradasi. Berdasarkan analisis metode gravimetri, diperoleh persentase biodegradasi tertinggi sebesar 72,15% pada penambahan 2% molase dengan 7 hari waktu inkubasi.

**Kata kunci : biodegradasi, Acinetobacter sp. P2(1), oil sludge, Heksadekana, Toluena, Naftalena, Fenantrena.**

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## ABSTRACT

This study aimed to evaluate the response of growth, and the percentage of hydrocarbons and oil sludge degradation by *Acinetobacter* sp. P2(1). There are two stages in this study, the first stage is a screening test for growth and biodegradability *Acinetobacter* sp. P2(1) on the four types of test substrate, namely hexadecane, toluene, naphthalene, and phenanthrene. The second stage is to test the optimization of oil sludge biodegradation by *Acinetobacter* sp. P2(1). In the second stage, this optimization of oil sludge biodegradation was observed by adding molasses with 0,1,2, and 3% concentration. This study is an experimental laboratory using a completely randomized design, with two replications, and have factorial at each stage of the research. The growth response was monitored by observation of TPC (Total Plate Count) and the final pH, whereas the percentage of biodegradation was analyzed using gravimetric method and the residual hydrocarbons were analyzed using GC-MS. At the optimization of oil sludge biodegradation with the addition of molasses, Emulsification Activity (AE) was observed to monitor the production of biosurfactant. Amount of TPC (Total Plate Count) and the calculation of the biodegradation percentage using gravimetric methods, were statistically analyzed using One-way ANOVA with Duncan and Games Howell test ( $p = 0.05$ ). The results showed that *Acinetobacter* sp. P2(1) can use a source of hydrocarbon as substrates growth nutrients. GC-MS analysis showed that *Acinetobacter* sp. P2(1) have the ability to degrade 42.857% of hexadecane, 100% of toluene, 76.154% of phenanthrene, and 80.631% of the naphthalene, with 100 ppm concentration. Molasses which is added in to oil sludge substrate, was proved to have an effect on the biodegradation by *Acinetobacter* sp. P2(1). Molasses acts as cometabolisme in biosurfactant that can increase the percentage of biodegradation. Based on the analysis of gravimetric method, the highest percentage of biodegradation is 72.15% with the addition of 2% molasses in 7 days of incubation.

**Keywords: biodegradation, *Acinetobacter* sp. P2(1), oil sludge, hexadecane, toluene, naphthalene, phenanthrene.**