BIODEGRADATION OF NAPHTHALENE BY BACTERIA ISOLATED FROM PORT DICKSON COASTAL WATERS

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by

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Dedicated to Papa and Mama -

for your unconditional love and sacrifice.

I love you both.

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May God bless all of you.

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ABSTRACT

A naphthalene degrading bacteria was isolated from the coastal waters of Port Dickson and was named Nap C in this study. The optimum growth condition for Nap C was at the temperature of 30°C, salinity of 30 ppt and pH 8. In saturated naphthalene medium, Nap C was capable of degrading naphthalene at a rate of 4.232×10^{-3} µg/l/day/cell. Nap C cells pre-exposed to naphthalene could degrade naphthalene ten times faster than the non-exposed cells. The naphthalene degradation rate for exposed cells was 4.990×10^{-2} µg/l/day/cell. Liquid chromatography column was used to separate aromatic hydrocarbons from the crude oil. The analysis showed that ESSO Tapis A crude oil consist of 18.15% of aromatic hydrocarbon fraction. The Nap C non-exposed cells was capable of degrading 8.17 ppm aromatic fraction crude oil in 10 days. The exposed Nap C cells however degraded aromatic hydrocarbons in crude oil faster than the unexposed cells whereby 17.70 ppm of aromatic fraction was degraded after 10 days incubation period. The biodegradation rate of aromatic crude oil for the non-exposed and exposed cells were 2.55×10^{-4} µg/l/day/cell and 9.56×10^{-4} µg/l/day/cell. Trace amount of ethanol and acetone in basal medium supported the growth of Nap C.

ABSTRAK

Bakteria yang berupaya menguraikan naftalena telah dipencilkan dari kawasan perairan Port Dickson. Bakteria ini dinamakan sebagai Nap C dalam kajian ini. Keadaan optima untuk pertumbuhan Nap C adalah pada suhu 30°C, saliniti 30 ppt dan pH 8. Dalam larutan tepu naftalena Nap C berupaya menguraikan naftalena pada kadar 4.232 x 10^{-3} µg/l/hari/sel. Sel-sel Nap C yang didedahkan terlebih dahulu kepada naftalena boleh menguraikan naftalena sepuluh kali lebih cepat berbanding sel-sel yang tidak didedahkan. Kadar penguraian naftalena untuk sel-sel terdedah ialah 4.990 x 10^{-2} µg/l/hari/sel. Kolum kromatografi cecair telah digunakan untuk memisahkan hidrokarbon aromatik daripada minyak mentah. Analisis tersebut menunjukkan bahawa minyak mentah ESSO Tapis A mengandungi 18.15% bahagian hidrokarbon aromatik. Sel-sel Nap C yang tidak terdedah kepada naftalena berupaya menguraikan 8.17 ppm bahagian hidrokarbon aromatik minyak mentah dalam jangkamasa 10 hari. Sel-sel Nap C yang terdedah pula menguraikan hidrokarbon aromatik minyak mentah lebih cepat berbanding sel-sel yang tidak terdedah di mana 17.70 ppm bahagian tersebut diuraikan selepas 10 hari. Kadar penguraian bahagian aromatik minyak mentah untuk sel-sel Nap C yang tidak terdedah dan terdedah adalah 2.55 x 10^{-4} µg/l/hari/sel and 9.56 x 10^{-4} µg/l/hari/sel masing-masing. Etanol dan aseton pada jumlah yang surih dalam larutan basal masing-masing menyokong pertumbuhan sel-sel Nap C.