

A STUDY ON THE DEGRADATION ABILITY OF THE BACTERIA ISOLATED FROM THE SEA OF MARMARA IN OIL HYDROCARBONS, TURKEY

Pelın Saliha Ciftci ^{1*} and Gulsen Altug ¹
¹ Istanbul University - pciftci@istanbul.edu.tr

Abstract

In this study oil hydrocarbon degradation effect of 122 strains which were isolated from the coastal area of the Marmara Sea were investigated. The highest oil hydrocarbon degradation effect with respect to pH and oil layer thickness was observed in the single cultures of 112-*Enterobacter sakazakii*.

Keywords: *Bacteria, Marmara Sea, Petroleum*

Introduction

The fate of spilled oil in the marine environments depends on a number of factors such as evaporation, dissolution, microbial degradation and photo-oxidation. Understanding the degradation capability of bacteria and selecting of the most suitable oil degrading bacteria are important for bioremediation process [1]. In this study the bacteria which were isolated potentially hydrocarbon polluted areas from the Marmara Sea were tested with respect to their oil degradation effect with an aim to detect the best candidate strains for further bioremediation studies.

Materials and Methods

The seawater samples were taken monthly from the four stations selected among ports (M1), oil stations (M2), marinas (M3) and fisherman shelters (M4) between July 2007 and June 2008. Isolates were identified [2] by API 20E and API 50 CHB (Biomereux, France). The single and mixed cultures of strains were screened using the Minimum Inhibition Concentration tests (MIC) with Batman crude oil (Figure 1). The isolates for which MIC values were determined were incubated in a shaking incubator at 150 rpm during 30 days and the ability of the isolates to degrade oil hydrocarbons was investigated by recording the oil layer thickness and the pH values in 72 hours intervals [3,4].

Results and Discussion

The differences of petroleum layer (cm) and pH values between the first and 30th days are shown in Figure 2. 112-E. sakazakii was recorded as the best candidate species between bacteria isolated from the studied area for bioremediation studies. The thickness of petroleum layer decreased from 1,2 cm to 0,2 cm in the single culture of E. sakazakii. In the single cultures of 111-E. corrodens and 109-P. aeruginosa, mixed culture I (P. aeruginosa+B. subtilis+E. coli), mixed culture II (P. aeruginosa+B. subtilis+V. fluvialis) the layer decreased from 1,2 cm to 0,4 cm. The petroleum layer thickness decreased from 1,2 cm to 1 cm in the single culture of 109-B. cepacia. Oil degradation abilities of the mixed culture III (K. oxytoca+P. oryzihabitans+ P. mirabilis+E. sakazakii+E. corrodens) and the single culture of 108-K. oxytoca, 107-A. hydrophila, 106-C. freundii, 105-Provıdencia sp., have observed as low. The stocking of bacteria able to degrade oil hydrocarbons constitute basic data for our further studies intended to analytically determine which fractions of the oil was degraded by these bacteria.

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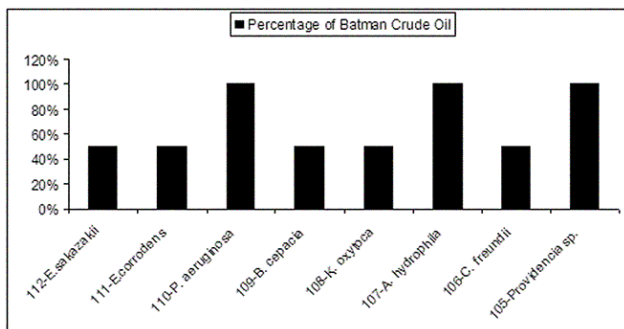


Fig. 1. The MIC values of the isolates

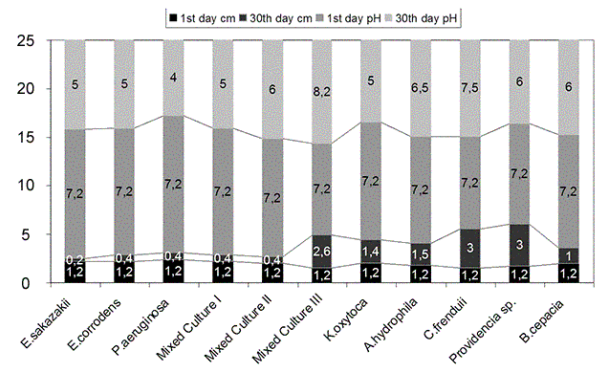


Fig. 2. The petroleum layer thickness (cm) and pH values of single and mixed cultures

References

- 1 - Reisfeld A., Rosenberg E. and Gutnick D., 1972. Microbial degradation of crude oil: Factors affecting the dispersion in sea water by mixed and pure cultures. *Appl. Microbiol.*, vol. 24, pp. 363-368.
- 2 - Hitchins A.D., Feng P., WATKINS W.D., RIPLEY S.R., CHANDLER L.A., 1992. *Escherichia coli* and the Coliforms. Bacteriological Analytical Manual. 7th ed. American Public Health Association (APHA), Washington, DC, pp. 27-29.
- 3 - Geiselbrecht A.D., Herwig, R.P., Deming J.W., Staley J.T., 1996. Enumeration and phylogenetic analysis of polycyclic aromatic hydrocarbon-degrading marine bacteria from Pudget Sound sediments. *Appl. Environ. Microbiol.* 62:3344-3349.
- 4 - Rahman K.S.M., Thahira-Rahman J., Lakshmanaperumalsamy P., Banat, I.M., 2002. Towards efficient crude oil degradation by a mixed bacterial consortium, *Bioresource Technology*, 85, 257-261.