

환경일반-P5 Environmental toxicity and biodegradation of
Pseudomonas sp. EL-G527 producing
biosurfactant

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1. Introduction

Surfactant addition could be an alternative to improve the mass transfer of the contaminants from the solid phase to the liquid phase. Some recent works have focused on the effect of surfactants on the biodegradation of hydrophobic compounds such as polycyclic aromatic hydrocarbons and some results have suggested that surfactants at low concentrations may be useful to improve *in situ* bioremediation of sites impacted with hydrophobic pollutants. Microorganisms usually produced biosurfactants that are nontoxic and biodegradable, and the role of these biosurfactants on the biodegradation of hydrophobic contaminants have been studied. Among the most studied biosurfactant, the rhamnolipid produced by *Pseudomonas aeruginosa* was shown effective in enhancing the biodegradation of petroleum hydrocarbon.

In this study, isolated *Pseudomonas* sp. EL-G527, biosurfactant producing strain, from environment, and investigated the characterization, environmental toxicity and biodegradability of *Pseudomonas* sp. EL-G527 producing biosurfactant.

2. Materials and Methods

2.1. Growth inhibition test

Growth inhibition test was carried out as Stromans method. Tested microbes were collected from activated sludge and Nack-dong river in Korea. Sludge flocs settled for about 15 min and used the fresh supernatant for inoculation. After water sample of Nack-dong river were filtered with Whatman No 1 filter paper, used for inoculation. The growth of microbes was determined by measuring the turbidity of a culture with spectrophotometer at 530nm. A decrease in growth at the end of the incubation period in the presence of an organic test medium and the test surfactants(Alkyl Sulfate (AS), Alkylpolyoxyethylene Ether (AE), Linear Alkyl Benzene Sulfonate (LAS), -Oleffin Sulfonate (AOS)), compared with that in a similar mixture without test surfactants was used to calculate the extent of inhibition from

an inhibition curve.

2.2. Biodegradation test

Used microbes and surfactants for biodegradation test were the same as growth inhibition test. Biodegradability was measured with surface tension increasing method. Set up 500ml Erlenmeyer flasks containing 250ml biodegradability test medium and inoculate with 1ml/100ml of the inoculum. And then, shaking incubated at 25 °C, 150rpm for 7 days.

3. Results and Discussion

To 100ppm of surfactant concentration, growth inhibition was determined low about activated sludge microbes. In the Nack-dong rivers microbes, from 100ppm of surfactant concentration, growth inhibition was observed. The biosurfactant from *Pseudomonas* sp. EL-G527 exhibited lower toxicity to bacterial population than synthetic surfactants.

Toxicity was determined as growth inhibition rate on each concentration. A decrease in growth at the end of the incubation period in the presence of the test surfactants, compared with that in a similar mixture without test surfactants was used to calculate the extent of inhibition from an inhibition curve.

In the Nack-dong rivers microbes, when surfactant concentration was 1000ppm, growth inhibition rate was showed highest in the Alkyl Sulfate (AS) as 94%, and Alkylpolyoxyethylene Ether (AE) 85%, Linear Alkyl Benzene Sulfonate (LAS) 81%, -Oleffin Sulfonate (AOS) 74%, respectively. In the biosurfactant case, growth inhibition rate was observed lowest as 25%.

Used microbes and surfactants for biodegradation test were the same as growth inhibition test. Biodegradability was measured with surface tension increasing method. Biosurfactant was rapidly biodegraded and lost its activity as surface-active material after 1-day incubation. However, LAS, AOS were not lost their surface tension after 7-days incubation.

Therefore, the biosurfactant from *Pseudomonas* sp. EL-G527 was effective surface-active compounds, more biodegradable and less toxic to microbial ecosystem than various synthetic surfactants.

4. Summery

A biosurfactant-producing microorganism, *Pseudomonas* sp. EL-G527 was isolated from activated sludge by enrichment culture when grown on mineral salt medium containing *n*-hexadecane as a carbon source. The biosurfactant from *Pseudomonas* sp.

EL-G527 exhibited lesser toxicity to bacterial population than synthetic surfactants and in the biodegradation test, biosurfactant was rapidly degraded and lost its activity as surface active material after 1 day incubation. In this study, the biosurfactant from *Pseudomonas* sp. EL-G527 was effective surface-active compound, more biodegradable and less toxic to microbial ecosystem than various synthetic surfactants.

Reference

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