ABSTRAK

Polietilen (PE) merupakan salah satu plastik yang paling banyak digunakan dan sulit terurai secara alami, sehingga akumulasi limbahnya menimbulkan dampak serius bagi lingkungan. Biodegradasi oleh mikroorganisme menjadi alternatif ramah lingkungan yang berkelanjutan. Bakteri sedimen laut dalam berpotensi memiliki enzim pendegradasi polimer sintetis, namun potensi bakteri dari Perairan Indonesia masih jarang dieksplorasi. Penelitian ini bertujuan untuk mengetahui kemampuan isolat bakteri asal sedimen laut dalam untuk mendegradasi PE, serta menidentifikasi bakteri potensial pendegradasi PE berdasarkan gen 16S rRNA. Enam isolat bakteri dipilih berdasarkan kemampuan mendegradasi *Polyethylene Glycol* (PEG) dan membentuk biofilm, kemudian diuji kemampuan biodegradasi PE selama 90 hari. Parameter yang diamati meliputi persentase degradasi PE, pertumbuhan bakteri, serta perubahan pH dan salinitas selama inkubasi. Analisis statistik dilakukan terhadap persentase degradasi dan parameter kinetik menggunakan uji Kruskal–Wallis dan uji lanjut Dunn, sedangkan parameter lainnya dianalisis secara deskriptif. Hasil penelitian menunjukkan bahwa seluruh isolat mampu mendegradasi PE dengan tingkat efektivitas yang berbeda. Isolat SS521 asal Laut Sawu menunjukkan kemampuan degradasi tertinggi dengan persentase sebesar 4,110 ± 0,694 % dan berbeda signifikan dengan kontrol. Analisis gen 16S rRNA mengidentifikasi isolat SS521 memiliki kedekatan tertinggi terhadap *Fictibacillus nanhaiensis* (99,16 %). Temuan ini menunjukkan bakteri sedimen laut dalam berpotensi sebagai agen biodegradasi PE ramah lingkungan.

Kata kunci *: Bakteri; biodegradasi; laut dalam; polietilen.*

ABSTRACT

Polyethylene (PE) is one of the most widely used plastics and is highly resistant to natural degradation, leading to the accumulation of plastic waste with serious environmental impacts. Microbial biodegradation represents a sustainable and environmentally friendly alternative. Deep-sea sediment bacteria are considered to possess unique enzymes capable of degrading synthetic polymers; however, bacteria from Indonesian waters remain poorly explored. This study aimed to evaluate the ability of deep-sea sediment bacterial isolates to degrade PE and to identify potential PE-degrading bacteria based on 16S rRNA gene analysis. Six bacterial isolates were selected based on their ability to degrade polyethylene glycol (PEG) and to form biofilms, and their polyethylene biodegradation capacity was assessed over a 90-day incubation period. The observed parameters included the percentage of PE degradation, bacterial growth, and changes in pH and salinity during incubation. Statistical analyses were performed on degradation percentages and kinetic parameters using the Kruskal–Wallis test followed by Dunn's post hoc test, while other parameters were analyzed descriptively. The results showed that all isolates were capable of degrading PE with varying degrees of effectiveness. Isolate SS521 from the Sawu Sea exhibited the highest degradation efficiency, with a degradation percentage of 4.110 ± 0.694%, and differed significantly from the control. Based on 16S rRNA gene analysis, isolate SS521 showed the highest sequence similarity to *Fictibacillus nanhaiensis* (99.16%). These findings indicate that deep-sea sediment bacteria have potential as environmentally friendly agents for PE biodegradation.

Key words : *Bacteria; biodegradation; deep sea; polyethylene.*