ABSTRACT

Predictive Metagenomic Insights into Bacterial Community Structure and LDPE Plastic Biodegradation Potential in Tanjung Mas Port, Semarang. Bodhicitta Wardaja. 24020123420010

Marine bacteria play an important role in maintaining marine ecosystems, including the biodegradation of plastics, by producing bioactive compounds that can help overcome waste. This study will explore *Low Density Polyethylene* (LDPE) plastic-degrading bacteria found in plastic waste biofilms on the northern coast of Semarang. The objective of this study is to isolate and culture in vitro bacteria that have the potential to degrade PE plastic using polyethylene glycol as a carbon source from the northern coast of Semarang and compare the results with metagenomic analysis. The research method was carried out by isolating and culturing in vitro isolates obtained from biofilms on PE plastic waste on selective Bushnell Haas Agar media enriched with 2% polyethylene glycol as the main carbon source. Metagenomic analysis was performed by isolating bacteria and extracting DNA, preparing libraries, and next-generation sequencing using Illumina novaseq6000. DNA extracts were amplified in the V3-V4 hypervariable region. In vitro tests produced four bacterial colonies that were morphologically different from those in Semarang City. The study obtained four isolates in vitro. Morphological observation of the colonies showed two Gram-negative bacterial colonies and two Gram-positive bacterial colonies. Metagenomic analysis successfully identified 104 genera of plastic-degrading bacteria in the waters of Semarang City, demonstrating their potential in combating plastic pollution in Indonesian seawater. This study shows the potential to improve bacterial isolates in degrading plastic, which will help achieve a long-term solution for plastic waste control in coastal areas. Metagenomic testing produced more than 936 isolates with metabolic pathways capable of playing a direct or indirect role in plastic degradation in the environment.

Keywords: *PE; Marine Pollution; Plastic-degrading Bacteria; Semarang City*