Biodegradasi Mikroplastik pada Skala Laboratorium oleh Mikroorganisme Asal Tempat Pembuangan Akhir Sampah

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Abstract

Microplastics are contaminants in the form of plastic fragments in millimeters to micrometers diluted in terrestrial and aquatic environments. They recently become a concern due to their negative impact on the quality of life of living things. Research about isolating and examining the ability of microplastic degrading microorganisms from landfills (TPA) in Cipayung, Depok, West Java, and Cipeucang, South Tangerang, Banten, has been carried out. This research aims to obtain bioremediation agents that can degrade microplastics. The source for isolation was leachate from both landfills. Isolation was conducted by direct and indirect (enriched) methods. Direct isolation used nutrient agar and potato dextrose agar media, either in the form of a full recipe or a tenth of a recipe with the addition of polyethylene, polypropylene, and polystyrene microplastics. Indirect isolation used Bushnell-Haas mineral media treated with microplastic. The morphology of the isolates was observed and the differences were described. Isolates were selected based on their ability to produce lipase in butter agar, then their ability to use microplastic as the only carbon source was examined. A total of 211 isolates were obtained, consisting of 74 bacteria and 137 fungi. Isolates with the highest ability to produce lipase with >1 halo zone index were CY1-1PE (I) which represented bacteria, and CC2-2F which represented fungi. In this current research, only CY1-1PE (I) was identified and proven to be able to degrade microplastics. Results based on the 16S rRNA gene showed that CY1-1PE (I) is Bacillus paramycoides, and the sequence has been deposited in GenBank with accession number MT995121. The results of the ability examination showed that this isolate was able to use all three types of microplastics, with the highest ability in polystyrene which was degraded up to 11.12% in 42 days. In conclusion, microorganisms isolated from landfill leachate of TPA Cipayung and TPA Cipeucang have potential as bioremediation agents that degrade microplastics, especially in terrestrial environments.

Keywords: *Bacillus*; Biodegradation; Landfill; Leachate; Microplastics; Polyethylene, Polypropylene; Polystyrene