Karakterisasi Isolat Bakteri dari Inlet dan Outlet Situ Kenanga Kampus Universitas Indonesia Depok dan Kemampuannya Dalam Mendegradasi Polietilena = Characterization of Bacterial Isolates from Kenanga Situ Inlet and Outlet, Universitas Indonesia Depok Campus and Their Ability to Degrade Polyethylene

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Abstrak

Kelimpahan mikroplastik pada perairan yang melebihi ambang batas aman perlu dilakukan remediasi. Bentuk-bentuk remediasi mikroplastik salah satunya adalah menggunakan agen biologis seperti bakteri. Bakteri dari sampel mikroplastik berhasil diisolasi dari air di inlet dan outlet Situ Kenanga, Kampus UI, Depok. Penelitian ini bertujuan untuk mengetahui kemampuan pertumbuhan delapan isolat bakteri pada variasi medium (ISP 1 agar, NA, dan LBA) dan suhu (25, 30, 35 dan 40°C), karakterisasi morfologi dan biokimia, serta kemampuan isolat bakteri terpilih untuk mendegradasi mikroplastik polietilena (PE). Pengujian aktivitas biokimia isolat bakteri dilakukan dengan uji fermentasi karbohidrat, oksidasi-fermentasi, produksi enzim katalase, dan sitrase. Berdasarkan pengujian variasi medium dan suhu menunjukkan bahwa keseluruhan isolat tumbuh optimum pada medium ISP 1 agar dan rentang suhu 30--35°C. Isolat KO1.1.3 positif pada uji degradasi substrat pati, sedangkan isolat KO1.3, KO2.2, KO2.3 dan KI2 dapat mendegradasi skim milk. Delapan isolat memiliki karakteristik biokimia yang bervariasi berdasarkan hasil uji. Hasil uji degradasi mikroplastik PE oleh kedua isolat terpilih menunjukkan bahwa tidak ditemukan adanya pengurangan berat granula PE setelah inkubasi selama 20 dan 45 hari. Pengamatan SEM menunjukkan adanya aktivitas degradasi pada permukaan granula PE ditandai dengan terbentuknya lubang oleh kedua isolat bakteri terpilih setelah 45 hari inkubasi. Hasil ini menunjukkan kedua isolat bakteri berpotensi dalam mendegradasi PE.

.....The abundance of microplastics in water that exceeds the safety threshold needs urgent remediation. Biological agents, such as bacteria, are one of the ways for microplastics remediation. Microplastics-associated bacteria were previously isolated from water samples at the inlet and outlet of Situ Kenanga, UI Campus, Depok. This study aims to determine the growth ability of eight bacterial isolates at various media (ISP 1 agar, NA, and LBA) and temperatures (25, 30, 35 and 40°C), morphological and biochemical characteristics, and the ability of selected bacterial isolates to degrade polyethylene (PE) microplastics. Biochemical activities of bacterial isolates were carried out by carbohydrates fermentation ability, oxidation-fermentation, catalase enzyme production, and citrate utilization tests. All isolates grew optimally on ISP 1 agar and a temperatures range of 30--35°C. Isolate KO1.1.3 was positive in the starch degradation test, while isolates KO1.3, KO2.2, KO2.3 and KI2 were able to degrade skim milk. All bacterial isolates were showing various biochemical characteristics. The results of PE degradation tests by the two selected isolates showed that there was no weight reduction of PE granules after 20 and 45 days of incubation. However, SEM observations showed degradation activity on the surface of the PE granules which was indicated by the crack’s formation after 45 days of incubation. These results indicated that the two bacterial isolates were potential for PE degradation.