ABSTRAK

Plastik jenis *low-density polyethylene* (LDPE) merupakan polimer sintetis turunan dari polietilen yang banyak digunakan untuk kemasan produk dan kantong belanja. Meningkatnya penggunaan LDPE menyebabkan masalah lingkungan yang semakin memburuk. Biodegradasi menggunakan mikroba laut menjadi metode penanganan sampah plastik yang ramah lingkungan. Dalam penelitian ini, dilakukan uji degradasi tiga jenis LDPE (bening, berwarna, dan *oxo-biodegradable*) menggunakan konsorsium mikroba laut (aktinomisetes, bakteri dan jamur) koleksi Laboratorium Mikrobiologi Laut BRIN Ancol. Uji degradasi dilakukan selama 90 hari pada media *Mineral Salt Medium*. Degradasi plastik dikonfirmasi oleh persentase penurunan berat kering, *Fourier-Transform Infrared Spectroscopy* (FTIR) dan *Scanning Electron Microscopy* (SEM). Persentase degradasi plastik LDPE bening (6,3 ± 0,29%) dan LDPE berwarna (3,8 ± 0,40%) lebih rendah dibandingkan dengan plastik LDPE *oxo-biodegradable* (10,9 ± 0,48%). Spektrum FTIR plastik LDPE menunjukkan perubahan gugus fungsi kimia seperti alkana, fenol, dan alkohol. Selain itu, perubahan topografi permukaan plastik diamati menggunakan SEM yang ditandai dengan adanya kerusakan seperti rongga dan retakan pada permukaan plastik. Kandungan zat aditif seperti pro-oksidan dapat mempercepat laju oksidasi pada plastik *oxo-biodegradable*. Penelitian ini juga mengkonfirmasi peran penting konsorsium dalam degradasi LDPE dibandingkan dengan mikroorganisme tunggal.

Kata Kunci: *biodegradasi, plastik LDPE, konsorsium mikroba*

ABSTRACT

Low-density polyethylene (LDPE) is a synthetic polymer derived from polyethylene that is widely used for product packaging and shopping bags. The increasing use of LDPE has led to worsening environmental problems. Biodegradation using marine microbes is an environmentally friendly method of handling plastic waste. In this study, three types of LDPE (clear, colored, and oxo-biodegradable) were degraded using a marine microbial consortium (actinomycetes, bacteria, and fungi) from BRIN Ancol Marine Microbiology Laboratory. The degradation test was conducted for 90 days on Mineral Salt Medium. Plastic degradation was confirmed by percentage dry weight loss, Fourier-Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM). The percentage degradation of clear LDPE (6.3 ± 0.29%) and colored LDPE (3.8 ± 0.40%) plastics was lower than that of oxo-biodegradable LDPE (10.9 ± 0.48%). The FTIR spectra of LDPE plastics showed changes in chemical functional groups such as alkanes, phenols, and alcohols. In addition, changes in the surface topography of the plastic were observed using SEM characterized by the presence of damage such as voids and cracks on the plastic surface. The content of additives such as pro-oxidants can accelerate the oxidation rate of oxo-biodegradable plastics. This study also confirmed the important role of consortium in LDPE degradation compared to single microorganisms.

Keywords: *biodegradation, LDPE plastic, microbial consortium*