

INTISARI

Latar belakang: Produksi plastik di dunia saat ini telah mencapai lebih dari 100 juta ton. Plastik bersifat tahan lama dan sulit didegradasi di lingkungan alamiah. Indonesia menghasilkan sampah plastik 26.500 ton per hari. Laju produksi sampah plastik tidak sebanding dengan laju penguraiannya. Akibatnya sampah plastik terakumulasi dan berpotensi mencemari lingkungan dan mengganggu kesehatan. Pembakaran sampah plastik menghasilkan zat-zat beracun yang berdampak serius terhadap kesehatan, diantaranya Dioksin dan Furan diklaim sebagai zat karsinogen. Penemuan berbagai bakteri khususnya *Pseudomonas sp* yang mampu mendegradasi plastik menjadi harapan baru bagi pengolahan sampah plastik. Teknik biodegradasi ini dinilai lebih ramah lingkungan.

Tujuan: Penelitian ini bertujuan mengetahui dan menganalisis kemampuan bakteri *Pseudomonas sp* dalam mendegradasi sampah plastik.

Metode: Penelitian ini bersifat quasi eksperimen dengan rancangan *post test only with control design*, memanfaatkan bakteri *Pseudomonas sp* lokal dari isolasi tanah TPA Piyungan. Bakteri ditumbuhkan pada media BHI, diseleksi dengan media *Cetrimide agar* (media selektif *Pseudomonas sp*), dan dikarakterisasi dengan metode *microbact kitt* seri 24E. Isolat terpilih disuspensikan dengan konsentrasi 10^6 CFU/ml, 10^7 CFU/ml, dan 10^8 CFU/ml. Variasi dosis suspensi ditambahkan masing-masing 10 ml ke dalam wadah berisi media *Standard Basal Salt* cair dan plastik (plastik hitam dan atau putih), dengan kelompok kontrol tanpa penambahan bakteri. Waktu inkubasi plastik 49 hari pada temperatur 37°C, dengan periodik pengukuran berat akhir setiap 7 hari. Pengukuran degradasi didasarkan pada persentase kehilangan bobot plastik sebelum dan sesudah inkubasi. Analisis data menggunakan anova dan *paired t-test* untuk mengetahui perbedaan perlakuan dan kontrol.

Hasil: Tiga isolat ditemukan dari tanah TPA Piyungan yaitu *Pseudomonas putida*, *Pseudomonas aeruginosa*, dan *Xenorhaptus luminescens*. *Pseudomonas putida* memberikan hasil degradasi tertinggi, dan dipilih sebagai stok kultur. Hasil analisis menyatakan terdapat perbedaan yang signifikan antara kelompok perlakuan dengan penambahan *Pseudomonas putida* dibandingkan dengan kontrol ditinjau dari persentase degradasinya. Persentase degradasi plastik putih pada hari ke-49 mencapai 3,29% dengan dosis respon 10^8 CFU/100mg plastik. Sedangkan plastik hitam persentase degradasinya mencapai 4,7% dengan dosis respon 10^7 CFU/100mg plastik hitam.

Kesimpulan: *Pseudomonas putida* mampu mendegradasi sampah plastik. Persentase degradasi plastik hitam lebih besar dibandingkan plastik putih. Plastik hitam lebih cepat terdegradasi dengan dosis respon lebih rendah dibandingkan plastik putih.

Kata kunci : Biodegradasi, Sampah plastik, *Pseudomonas putida*

ABSTRACT

Introduction: Plastic production in the world today has reached more than 100 million tons. Plastics are durable and difficult to degrade in the natural environment. Indonesia produces 26,500 tons of plastic waste per day. The rate of production of plastic waste is not comparable to the rate of decay. As a result of plastic waste accumulating and potentially pollute the environment and damage the health. Burning of plastic waste produces toxic substances that have a serious impact on health, including Dioxin and Furan claimed as carcinogens. The discovery of various bacteria, especially *Pseudomonas* sp were able to degrade the plastic into new hope for processing waste plastic. Biodegradation is considered more environmentally friendly.

Aim of Study: The aim of this study was to identify and analyze the ability of *Pseudomonas* sp for plastic waste degradation.

Method: This study was a quasi-experimental design with post-test only with control design, using local *Pseudomonas* sp insulated of Piyungan landfill. Fertilizer media used BHI and selective medium for *Pseudomonas* Sp namely Cetrimide agar, and characterized by a series of microbact 24E kitt. Isolate elected was suspended with concentration 10^6 CFU/ml, 10^7 CFU/ml, and 10^8 CFU /ml. Furthermore, distributed with volume of 10 ml suspension into each container that containing liquid of standard medium of Basal Salt and plastic (plastic black and white), with control negative (without the addition of bacteria). The incubation time for the plastic to degrade was 49 days at a temperature of 37°C, with periodic harvesting plastic every 7 days. Determination of degradation products is based on the percentage of weight loss plastic after treatment. The data analysis use anova and paired t-test to determine differences in treatment and control.

Result: Three isolate were fund : *Pseudomonas putida*, *Pseudomonas aeruginosa*, dan *Xenorhaptus luminescens*. *Pseudomonas putida* gave the greater percentage of degradation. Results of this research showed that there are significant differences between the addition of *Pseudomonas putida* into media containing plastic compared to control, according to percentage of degradation.. The percentage of degradation of the white plastic in the 49 days reached 3.29%, with a dose response of 10^8 CFU /100mg plastic while the black plastic was degraded with the percentage of degradation reached 4.7%, with a dose response of 10^7 CFU /100mg black plastic.

Conclusion: *Pseudomonas putida* can degrade the plastic black or white. Percentage degradation of black plastic is greater than white plastic. Black plastic degraded faster than white plastic. Dose response *Pseudomonas putida* for the black plastic is lower than white plastic.

Key words: Biodegradation, waste plastics, *Pseudomonas putida*.