Abstract

DEGRADATION OF BIOPLASTIC MATERIAL WITH AMYLUM BLENDING BY AMYLOLYTIC FUNGI ISOLATED FROM WASTE DISPOSAL CENTRES

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Production and usage of bioplastic is known as an alternative solution to reduce negative effects of plastic waste accumulation. Bioplastic with amylum blending has been used since last couple years. However degradation process in natural environments still less-efficient. Another proposed solution for this certain flaw is the utilization of amylolytic fungi to enhance the degradation process. This research was conducted to isolate and select amylolytic fungi from the soil of waste disposal centre that degrades bioplastic.

Soil samples were taken from 3 different regions of waste disposal centres namely Piyungan (Yogyakarta Special Region), Balikpapan (East Kalimantan), and Seputih Mataram (Lampung) with random composite sampling method. Isolates were examined and selected based on their amylolytic activity. The isolates with higher amylolytic activity were tested to confirm and measure their degradation capability by applying them into bioplastic samples. Degradation capability was based on the weight reduction of the plastic samples after incubation period of 30 days in Potato Dextrose Broth medium. To analyze the change of chemical structure, at end of incubation time the bioplastics were analyzed with Scanning Electron Microscopy (SEM).

From the three regions of waste disposal centres resulted in 24 fungi isolates, 17 isolates have amylolytic activity and among them 7 isolates have considerably higher activity ranged from 1,4-2,1. Those 7 isolates with higher amylolytic activity were then selected by their degradation efficiency rate and resulted two superior strains coded as TK5 and TK7, with degradation percentage of 45,45% and 36,36%, respectively. Biomass growth and amylase specific enzyme activity of TK5 and TK7 could be a factor that increase the degradation process. SEM analysis showed the change of polymeric structure of the plastic as the result of biodegradation process from the superior isolates.

Keywords: degradation, bioplastic, amylolytic fungi, waste disposal centre

Intisari

DEGRADASI BAHAN BIOPLASTIK DENGAN *BLENDING* AMILUM OLEH JAMUR AMILOLITIK YANG DIISOLASI DARI TEMPAT PEMBUANGAN SAMPAH (TPS)

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Produksi dan penggunaan bioplastik merupakan salah satu cara untuk mengurangi dampak negatif dari akumulasi sampah plastik. Bioplastik dengan amilum sebagai bahan aditif sudah banyak digunakan sejak beberapa tahun terakhir. Namun proses degradasi yang terjadi di alam masih kurang efektif. Solusi yang dapat dilakukan adalah dengan pemanfaatan jamur amilolitik untuk mempercepat proses degradasi plastik. Penelitian ini bertujuan untuk mengisolasi dan menyeleksi jamur amilolitik dari tanah Tempat Pembuangan Sampah (TPS), yang mampu mendegradasi bioplastik.

Sampel tanah diambil dari sekitar TPS di daerah Piyungan (Daerah Istimewa Yogyakarta), Balikpapan (Kalimantan Timur), dan Seputih Mataram (Lampung Tengah) dengan metode *sampling* secara acak. Isolat kemudian diuji dan dipilih berdasarkan aktivitas amilolitiknya secara kualitatif. Isolat dengan aktivitas amilolitik tinggi kemudian diuji kemampuan degradasinya terhadap sampel bioplastik. Aktivitas degradasi didasarkan pada perbedaan berat sampel plastik setelah diinkubasi selama 30 hari dalam medium *Potato Dextrose Broth* (PDB). Perubahan struktur permukaan sampel plastik dianalisis dengan *Scanning Electron Microscopy* (SEM).

Dari tiga wilayah TPS di atas diperoleh 24 isolat jamur, 16 isolat memiliki aktivitas amilolitik, dan 7 diantaranya memiliki aktivitas relatif tinggi, yaitu berkisar antara 1,4-2,1. Dari 7 isolat amilolitik terpilih, kemudian diseleksi berdasarkan efisiensi degradasinya dan menghasilkan dua isolat unggul yaitu TK5 dan TK7, dengan persentase degradasi masing-masing isolat 45,45% dan 36,36%. Kurva pertumbuhan biomassa dan aktivitas enzim amilase spesifik yang tinggi dari isolat TK5 dan TK7 juga merupakan faktor yang membantu mempercepat proses degradasi. Hasil analisis SEM menunjukkan adanya kerusakan struktur permukaan plastik sebagai hasil dari proses biodegradasi kedua isolat unggul tersebut.

Kata kunci: degradasi, bioplastik, jamur amilolitik, Tempat Pembuangan Sampah (TPS)