

**ISOLATION OF SOLUBILIZING MICROORGANISMS FROM  
LANDFILL SOIL**

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## ABSTRACT

Landfill system contains many types of solubilizing microorganisms with the potential to degrade the solid waste compound. This research was to demonstrate isolation, characterization and screening of cellulolytic and xylanolytic microorganisms from landfill soil and quantification of their enzymatic activity. Sample was collected from landfill soil of landfill site at Sg. Ikan, Kuala Terengganu, Malaysia. Isolation of the solubilizing microorganism was conducted via standard serial dilution and spread plate method using nutrient agar medium and these microorganisms were further characterized by morphological characteristics and Gram-staining. Screening tests demonstrated the ability of microorganism to produce cellulase and xylanase enzyme via Gram's iodine-staining. Finally, selected isolates were subjected to enzyme activity quantification such as total cellulase, endoglucanase, exoglucanase and xylanase assay analysis. A total of 58 different isolates were isolated from landfill soil which Gram-positive bacilli were the dominant microorganism. Out of 58 isolates, 29 isolates were selected for further testing. After Gram's iodine staining, there were 23 cellulolytic microorganisms and 26 xylanolytic microorganisms which showed clear zones on agar plate containing carboxymethyl cellulose and xylan, respectively. Two isolates out of 23 cellulolytic microorganisms and three isolates out of 26 xylanolytic microorganisms with ratio of clear zone (D/d) more than 3.3 were further tested for quantification of enzyme activity. Cellulolytic microorganism M12 had the highest endoglucanase activity at  $1.7621 \pm 0.0054$  U/mL while cellulolytic microorganism M28 had the highest total cellulase activity and exoglucanase activity at  $1.6086 \pm 0.0007$  U/mL and  $1.8299 \pm 0.0704$  U/mL, respectively. Meanwhile, xylanolytic microorganism M15 had the highest xylanase activity at  $8235 \pm 0.1715$  U/mL. In conclusion, the 58 microorganisms were isolated which initiated research on industrially important microorganism from landfill soil and these isolates may be vital source for the discovery of industrial useful enzymes especially in municipal solid waste degradation.

## ABSTRAK

Sistem tapak pelupusan sampah mengandungi pelbagai jenis mikroorganisma yang berpotensi untuk merendahkan kompaun sisa pepejal. Kajian ini adalah untuk pengasingan, pencirian dan pemeriksaan *cellulolytic* dan *xylanolytic* mikroorganisma dari tanah tapak pelupusan dan juga menguantifikasi aktiviti enzim mereka. Sampel diambil dari tanah tapak pelupusan tapak pelupusan sampah di Sg. Ikan, Kuala Terengganu, Malaysia. Pengasingan mikroorganisma dijalankan melalui pencairan bersiri dan kaedah *spread plate* menggunakan medium *nutrient agar* dan mikroorganisma ini telah disifatkan lagi dengan ciri-ciri morfologi dan *Gram-staining*. Ujian saringan menunjukkan keupayaan mikroorganisma untuk menghasilkan *cellulase* dan enzim *xylanase* melalui *Gram's iodine-staining*. Akhir sekali, beberapa mikroorganisma dipilih untuk menguantifikasi aktiviti enzim seperti *total cellulase*, *endoglucanase*, *exoglucanase* dan *xylanase*. Sebanyak 58 mikroorganisma yang berbeza telah diasingkan daripada tanah tapak pelupusan di mana Gram-positif *bacilli* adalah mikroorganisma dominan iaitu menyumbang sebanyak 66% daripada 58 mikroorganisma. Daripada 58 mikroorganisma, 29 mikroorganisma telah dipilih untuk ujian lanjut. Selepas *Gram's iodine-staining*, terdapat 23 *cellulolytic* mikroorganisma dan 26 *xylanolytic* mikroorganisma yang menunjukkan zon jelas pada plat agar yang mengandungi *carboxymethyl cellulose* dan *xylan*. Dua mikroorganisma daripada 23 *cellulolytic* mikroorganisma dan tiga mikroorganisma daripada 26 *xylanolytic* mikroorganisma dengan nisbah zon jelas (D/d) lebih daripada 3.3 telah dipilih untuk kuantifikasi aktiviti enzim. *Cellulolytic* mikroorganisma M12 telah mempunyai aktiviti *endoglucanase* tertinggi pada  $1,7621 \pm 0,0054$  U/mL manakala *cellulolytic* mikroorganisma M28 telah mempunyai jumlah aktiviti *cellulase* yang paling tinggi dan aktiviti *exoglucanase* pada  $1,6086 \pm 0,0007$  U/mL dan  $1,8299 \pm 0,0704$  U/mL, masing-masing. Sementara itu, *xylanolytic* mikroorganisma M15 telah mempunyai aktiviti *xylanase* tertinggi pada  $8235 \pm 0.1715$  U/mL. Kesimpulannya, 58 mikroorganisma telah diasingkan yang dapat memulakan penyelidikan ke atas mikroorganisma perindustrian penting dari tanah tapak pelupusan dan kaedah pengasingan mikroorganisma ini boleh menjadi sumber penting bagi penemuan enzim berguna di dalam industri terutama dalam degradasi sisa pepejal perbandaran.