

## ABSTRACT

Phenanthrene is a type of polycyclic aromatic hydrocarbon (PAH). It is an organic pollutant that exists persistently in the environment, resulting mainly from anthropogenic activities. Out of the 24 different fungi that had been successfully isolated from water hyacinth (*Eicchornia crassipes*), 5 fungal isolates showed the ability to degrade phenanthrene. Isolates EC08 and EC22, showed higher rate of phenanthrene degradation as compared to isolates EC04, EC13, and EC18. Percentage of phenanthrene degradation of EC08 and EC22 after 7 days was shown to be 8.26% and 14.19%, respectively. All five isolates showed the presence of manganese peroxidase (MnP), lignin peroxidase (LiP), and laccase (Lacc) activities in the presence of phenanthrene. The magnitude of the enzyme activities did not correlate with the percentage of phenanthrene degradation by the fungi. This suggests that other enzymes apart from the ligninolytic enzymes might be involved in the degradation pathways, and that the phenanthrene degradation involves a complex multienzymatic system. The physical and chemical parameters that can affect the growth of fungi and the rate of phenanthrene degradation were studied. It was observed that, each of the isolate showed different preferences in the pH of the growth media, the supplemental carbon, as well as the supplemental nitrogen. Identification of the five isolates was done based on their morphology as well as through molecular analysis. Through the analysis, isolates EC04, EC08, and EC22 were identified as *Phlebia acanthocystis*, *Penicillium pinophilum*, and *Aspergillus versicolor* respectively, while isolates EC13 and EC18 were identified as *Inonotus pachyphyleous* T61 and *Inonotus pachyphloeus* RS1, respectively.

**Keywords:** Phenanthrene, degradation, ligninolytic enzymes, manganese peroxidase, lignin peroxidase, laccase

***Penyaringan dan Biodegradasi Hidrokarbon Aromatik Polisiklik Menggunakan Fungi Endofitik Asli***

**ABSTRAK**

*Fenantrena adalah sejenis hidrokarbon aromatik polisiklik (PAH). Ia merupakan pencemar organik yang wujud di alam sekitar yang terhasil terutamanya daripada aktiviti antropogenik. Di antara 24 jenis fungi berlainan yang telah berjaya diasingkan dari keladi bunting (Eicchornia crassipes), 5 fungus menunjukkan keupayaan untuk mendegradasi fenantrena. Isolasi EC08 dan EC22 menunjukkan kadar degradasi fenantrena yang lebih tinggi berbanding dengan isolasi EC04, EC13, dan EC18. Peratusan degradasi fenantrena untuk fungus EC08 dan EC22 selepas 7 hari adalah masing-masing 8.26% dan 14.19%. Kesemua 5 isolasi menunjukkan kehadiran aktiviti manganese peroxidase (MnP), lignin peroxidase (LiP), dan laccase (Lacc) dengan kehadiran fenantrena. Magnitud aktiviti enzim tidak menunjukkan hubung kait dengan peratusan degradasi fenantrena oleh fungus-fungus tersebut. Ini mencadangkan bahawa mungkin terdapat enzim-enzim lain selain daripada enzim ligninolitik yang terlibat dengan proses degradasi tersebut, dan degradasi fenantrena melibatkan sistem multi enzim yang kompleks. Parameter fizikal dan kimia yang dapat memberi kesan kepada pertumbuhan fungus-fungus dan kadar degradasi fenantrena telah dikaji. Pemerhatian menunjukkan bahawa fungus-fungus tersebut mempunyai kecenderungan yang berbeza bagi pH media pertumbuhan, karbon tambahan, dan nitrogen tambahan. Penentuan untuk lima isolasi fungus tersebut telah dilakukan berdasarkan morfologi dan melalui analisis molekular. Menerusi analisis tersebut, isolasi EC04, EC08 dan EC22 telah masing-masing dikenalpasti sebagai Phlebia acanthocystis, Penicillium pinophilum, dan Aspergillus versicolor, sementara isolasi EC13 dan EC18 telah dikenalpasti sebagai Inonotus pachyphloeus T61 dan Inonotus pachyphloeus RS1.*