New Zealand Journal of Botany

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tnzb20

The mycoremediation potential of phyllosphere fungi in urban ornamental plants in Sri Lanka with mathematical models for PAH degradation

Nadeema Dharmasiri, Sagarika Kannangara, Lanka Undugoda, Jayantha Munasinghe, Ruvini Madushika, Kasun M. Thambugala, Chathuri Gunathunga & Dayani Pavalakumar

To cite this article: Nadeema Dharmasiri, Sagarika Kannangara, Lanka Undugoda, Jayantha Munasinghe, Ruvini Madushika, Kasun M. Thambugala, Chathuri Gunathunga & Dayani Pavalakumar (05 Sep 2024): The mycoremediation potential of phyllosphere fungi in urban ornamental plants in Sri Lanka with mathematical models for PAH degradation, New Zealand Journal of Botany, DOI: 10.1080/0028825X.2024.2398007

To link to this article: https://doi.org/10.1080/0028825X.2024.2398007

Published online: 05 Sep 2024.

NEW ZEALAND JOURNAL OF BOTANY
https://doi.org/10.1080/0028825X.2024.2398007

Taylor & Francis
Taylor & Francis Group

RESEARCH ARTICLE

The mycoremediation potential of phyllosphere fungi in urban ornamental plants in Sri Lanka with mathematical models for PAH degradation

Nadeema Dharmasiri [a,b], Sagarika Kannangara [c], Lanka Undugoda [a], Jayantha Munasinghe [d], Ruvini Madushika [d], Kasun M. Thambugala [e,f,g], Chathuri Gunathunga [a,b] and Dayani Pavalakumar [a,b]

[a]Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka; [b]Faculty of Graduate Studies, University of Sri Jayewardenepura, Nugegoda, Sri Lanka; [c]Department of Plant and Molecular Biology, University of Kelaniya, Colombo, Sri Lanka; [d]Department of Mathematics, Faculty of Science, Colombo, University of Kelaniya; [e]Genetics and Molecular Biology Unit, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka; [f]Center for Biotechnology, Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka; [g]Center for Plant Materials and Herbal Product Research, Department of Botany, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

ABSTRACT

Currently, phylloremediation has emerged as a highly effective method for eliminating air pollutants, particularly polyaromatic hydrocarbons (PAHs). When PAHs accumulate on the phyllosphere, they significantly impact the fungal communities residing on leaf surfaces. This study aimed to investigate how pollution distribution patterns affect the diversity and PAH-degrading abilities of phyllosphere fungi, alongside identifying suitable mathematical models for PAH degradation. Leaf samples from two locations, Maradana and Sapugaskanda, were identified as having the highest PAH concentrations through principal component analysis. The fungal diversity in these highly contaminated regions was varied, with dominant species exhibiting greater PAH-degrading capabilities than those in less polluted areas. Thirty-five morphologically different epiphytic fungal strains were isolated on Potato Dextrose Agar (PDA) medium using the sample leaf wash. Two different fungal strains were selected as the best PAH degraders among those 35 different strains. These fungal strains were identified as *Trichoderma harzianum* P_4M-16, and *Fusarium solani* P_{11}M-46 based on ITS sequence data. Notably, these fungal species were more prevalent in highly polluted urban areas compared to less contaminated sites. High-Performance Liquid Chromatography (HPLC) analysis revealed that these two fungal species degrade PAHs more efficiently than others. Their kinetics assays demonstrated alignment with four degradation models when breaking down phenanthrene, naphthalene, pyrene, and anthracene. Scanning electron microscopy images showed that these fungi function as endophytes, extending their mycelium into the core leaf tissue layers beyond the epidermis. Gas Chromatography-Mass Spectrometry (GCMS) analysis indicated

ARTICLE HISTORY
Received 14 June 2024
Accepted 26 August 2024

HANDLING EDITOR
Milan Samarakoon

KEYWORDS
Bioremediation; frequency of occurrence; *Fusarium*; GCMS; HPLC; phyllosphere; toxicity; *Trichoderma*

CONTACT Lanka Undugoda lankaundugoda@sjp.ac.lk; Jayantha Munasinghe munasing@kln.ac.lk