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Role of Plant Rhizosphere During Indoor Volatile Organic Compound Remediation by Plants

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Abstract

A wide range of volatile organic compounds (VOC) are released from building materials, household products and human activities. These have the potential to reduce indoor air quality (IAQ), poor IAQ remains a serious threat to human health. Whilst the ability of the single plant species to remove VOC from the air through a process called phytoremediation is widely recognised, little evidence is available for the value of mixed plant species (i.e. plant communities) in this respect. The work reported herein explored the potential of plant communities to remove the three most dominant VOCs: benzene, toluene and m-xylene (BTX) from indoor air. During phytoremediation, bacteria in the root zone (rhizosphere) of plants are considered the principal site contributing to the VOC reduction. This project explored BTX degrading bacteria in the rhizosphere through culture-dependent and independent approaches.

Some bacteria in the rhizosphere utilised gaseous BTX as their sole carbon and energy sources were isolated on minimal salt agar. The majority of isolated bacteria were Gram-positive and belonged to the phylum Actinobacteria. Most of the identified bacteria belonged to the genera Microbacterium, Rhodococcus, Arthrobacter and Pseudomonas. In considering the impact of BTX upon the hizosphere microbiome, it was shown that overall there were little compositional and functional changes following exposure to 10 ppm gaseous benzene. Findings from this work enhanced our understanding of the benefit of indoor plants in relation to VOC remediation and the consequent improvement of phytoremediation systems for the protection of public health.

Biography:

Dilhani de Silva has recently completed her PhD from Staffordshire University, MSc study from the University of Wolverhampton. During her PhD, she studied the volatile organic compounds remediation by indoor plant species by employing techniques in Molecular Biology, Microbiology, Chemistry and Bioinformatics. During her MSc research, she studied biofilm formation and antimicrobial susceptibility of Salmonella typhimurium on food processing surfaces. Currently, she works as an independent researcher in the field of air pollution. She has more than 10 conference publications in national and international conferences.