SEASONAL VARIATION OF HYDROCARBON DEGRADATION GENES IN URBAN GREEN AREA SOILS OF VILNIUS

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Urban soils in green areas are frequently exposed to hydrocarbon pollution, particularly in environments influenced by road traffic, construction activities as well as other anthropogenic factors. Microorganisms play a crucial role in the natural degradation of these contaminants, and functional genes encoding degrading enzymes can serve as indicators of soil biodegradation potential. Despite their importance, the seasonal dynamics of these genes in urban environments remain poorly characterized. This study investigated the presence and seasonal variation of genes involved in hydrocarbon degradation in the urban green area soils of Vilnius. Soil samples were collected during autumn and spring seasons near four streets: Ševčenkos, Gerosios Vilties, Baltupių, and Antakalnio. Total DNA was extracted and PCR was used to screen for genes encoding enzymes involved in the degradation of aliphatic, aromatic, and polycyclic aromatic hydrocarbons. Quantitative real-time PCR (qPCR) was applied to assess seasonal changes in the relative abundance of the phenol hydroxylase gene (*phe*), and amplification specificity was confirmed by melting curve analysis. Results showed that the gene associated with aromatic hydrocarbon degradation (*phe*) was prevalent and detected in most samples, whereas genes for aliphatic and polycyclic aromatic degradation were not identified. Statistically significant seasonal differences in *phe* gene abundance were observed at the Baltupiai site, while no significant changes were detected at other locations. Sequencing analysis revealed that *phe* sequences were affiliated with bacterial genera such as *Pseudomonas*, *Rhodococcus*, and *Sphingomonas*, with a distinct dominance pattern observed in the Baltupiai spring sample. Overall, these results demonstrate that Vilnius urban soils harbor microorganisms with the genetic potential for aromatic hydrocarbon degradation and highlight the spatial and seasonal variability of this potential in urban green infrastructure.