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**Soil Remediation Potential: Evaluation of Polycyclic Aromatic Hydrocarbon Degradation by a Bacterial Consortium Influenced by Silver (Ag) Stress****Jayasena, C., Abdul, M., Kodikara, L., Udayakumaran, V., Madawita Withana, D.K., Dharmasiri, R.B.N.\* , Madanayake, K.***Department of Life and Medical Sciences, BMS, Colombo 06, Sri Lanka**\*nadeema.d@bms.ac.lk***Abstract**

Soil contamination with persistent environmental pollutants such as Polycyclic Aromatic Hydrocarbons (PAHs) poses a critical environmental challenge, particularly in areas that have undergone rapid industrialization and accumulation of waste. Compounds such as PAHs are highly resistant to natural degradation and are often co-contaminants alongside heavy metals such as silver. These ubiquitous pollutants pose a significant health risk to organisms due to their carcinogenicity and mutagenicity, threatening soil fertility, groundwater quality, as well as food safety, necessitating sustainable bioremediation strategies. This study aimed to isolate PAH degrading bacteria from four soil samples in dumping sites across Sri Lanka (Colombo, Galle, Jaffna and Kandy) to form a consortium and evaluate its potential for phenanthrene and naphthalene degradation under silver-induced stress. Ten morphologically different bacteria were isolated from soil samples, of which four strains (CHR-J7, CHR-J5, CHR-C15 and CHR-G10) were chosen for the consortium after they showed consistent growth on selective media prepared using BBH agar spiked with PAHs. Spectrophotometric analysis revealed that all four strains showed promising degradation, with CHR-J7 displaying the highest degradation of both PAHs. The optimal degradation of phenanthrene was observed to be at 40 ppm (52.03%) and that of naphthalene was at 30 ppm (38.96%). Antagonistic assays confirmed compatibility among the selected strains, and the strains CHR-J7 and CHR-G10 were identified to be as *Glutamicibacter ectropisis* (PV942265) and *Achromobacter insolitus* (PV942243) respectively by 16S rRNA sequencing. Toxicity bioassays with *Artemia salina* and *Vigna radiata* revealed low cytotoxic and high phytotoxic effects under the tested conditions. Highest PAH concentrations were observed to be in soil samples from urbanized areas such as Colombo and Jaffna by High Performance Liquid Chromatography (HPLC) analysis. The key degradation assays for four bacterial strain samples were carried out in triplicates to ensure data reliability. These findings suggest that these indigenous bacterial consortia can be used as a potential biological agent in the remediation of soil co-contaminated with PAHs and silver. Biotechnological approaches such as soil remediation with bacterial consortiums hold promises for mitigating the persistence of soil pollutants and contributing to soil and water remediation strategies, restoring contaminated soils and safeguarding the quality of groundwater. Further research around genetic analyses, optimizing the bacterial strain ratios, and different environmental conditions in field-scale applications is recommended for enhancing the effectiveness of this bioremediation approach.

**Keywords:** *Polycyclic aromatic hydrocarbons, Bacterial consortium, Bioremediation, Soil contamination, Heavy metals*