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Evaluating the Relationship Between Chemical Oxygen Demand (COD) and Polycyclic Aromatic Hydrocarbons (PAHs) in Kelani River**Adhikari, P.A.A.S.¹, Bandara, K.R.V.^{1,2}, Manage, P.M.^{1*}**¹*Center for Water quality and Algae Research, Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*²*Department of Aquatic Bioresources, Faculty of Urban and Aquatic Bioresources, University of Sri Jayewardenepura, Nugegoda, Sri Lanka***pathmalal@sjp.ac.lk***Abstract**

Polycyclic Aromatic Hydrocarbons (PAHs) are persistent organic pollutants that originate from both petrogenic and pyrogenic sources, with significant ecological and human health risks. Among them naphthalene (NAP) and phenanthrene (PHE) are two low molecular-weight PAHs that are classified as “priority pollutants” by the United States Environmental Protection Agency. Chemical Oxygen Demand (COD) is widely employed in water quality assessments as an indicator of total organic load. This study examined the relationship between COD and PAHs in surface water samples from the meandering part of the Kelani River basin, Sri Lanka. Samples were collected from thirteen locations with triplicate measurements obtained during two distinct seasons to capture spatial and temporal variability. The water samples were collected into amber color glass bottles by dipping the sampler below 10 cm of the water surface to minimize air entrapment and preserved in a refrigerator below 4 °C until analysis was done. COD was determined using the dichromate oxidation method, while priority PAHs specifically NAP and PHE were quantified by using high-performance liquid chromatography (HPLC) with UV detection following the liquid-liquid extraction using hexane and acetone. HPLC calibration demonstrated excellent linearity with strong correlations between peak area and concentration for PHE ($R^2=0.999$) and NAP ($R^2=0.991$), underscoring the robustness of the standard curves. The concentrations of NAP ranged from 2.499 to 8.414 mg/L in the wet season and 0.005 to 9.658 mg/L in the dry season, while PHE varied between 0.248 mg/L during the wet season and undetectable to 0.329 mg/L in dry season, across sampling sites. COD values spanned from 10.6 to 32.0 mg/L (wet season) while varying from 12.4 to 42.6 mg/L (dry season) with markedly higher loads observed in urban and industrially influenced locations. Seasonal analysis indicated that both PAHs and COD were elevated during the dry season compared to the wet season due to reduced dilution and enhanced accumulation effects. Pearson correlation analysis revealed a significant positive association between COD and PAHs concentrations (wet season: $r=0.94$; dry season: $r=0.98$). These findings suggest that COD could serve as a potential surrogate indicator of PAHs contamination providing a rapid and cost-effective screening tool for aquatic pollution monitoring particularly in resource-limited contexts.

Keywords: *Polycyclic aromatic hydrocarbons, HPLC, Naphthalene, Phenanthrene, COD*