

Characterizing Surfactant Effect on Phytoremediation of Carcinogenic Anthracene by *Eichhornia crassipes* Plant

PK Vithanage¹, MTD Perera¹, UKA Samarasinghe², LDAM Arawwawala²
and PM Colonne^{1#}

¹Department of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka

²Industrial Technology Institute, Herbal Technology Section, Baudhdhaloka Mawatha,
Colombo 07, Sri Lanka

colonnepm@kln.ac.lk

Anthracene is a mutagenic and carcinogenic polycyclic aromatic hydrocarbon mainly found in crude oil. Anthracene shows bioaccumulation and biomagnification due to its high lipid solubility. Therefore, anthracene has the ability to accumulate in toxic levels at higher trophic level organisms. A high stability makes this organic pollutant harder to remove from the environment. This study aims to characterize alternative plant-based bioremediation techniques to clean up anthracene from crude oil-contaminated aquatic ecosystems. We tested whether *Eichhornia crassipes*, an invasive water plant commonly known as water hyacinth is capable of absorbing anthracene from contaminated water. Considering the low water solubility and mass transfer of anthracene, we further investigated how a non-ionic surfactant Triton-X-100 could affect anthracene absorption into the water hyacinth plant. Plants were treated with anthracene-spiked crude oil-containing water with or without Triton-X-100 and grown for 11 days. Plant roots were cleaned, freeze-dried, and subjected to ultra-sonication. Anthracene was extracted from root tissues using dichloromethane: acetone mixture. Silica column chromatography was performed for further purification. Identification and quantification of anthracene were performed using high-performance liquid chromatography, using a C18 reverse phase column. Control plants were grown in fresh water. Results indicated that the water hyacinth plant absorbed 1.98 ± 0.66 mg/kg of anthracene into the root tissues. The presence of Triton-X-100 significantly increased anthracene uptake to 11.06 ± 0.31 mg/kg. This represents a surfactant-mediated 5.6-fold increase in anthracene uptake in the plant. Using Triton-X-100 can be a viable option to enhance the efficacy of anthracene removal from contaminated waters by water hyacinth plants.

Keywords: *Eichhornia crassipes*, anthracene, phytoremediation, Triton-X-100