King Abdulaziz University
Faculty of Science
Department of Biological Sciences

BIOREMEDIATION OF INDUSTRIAL PHENOL-CONTAMINATED WASTEWATER USING BACTERIAL BIOFILTER

[(1)] Nidal Mohammed Zabermawi *, [(1)] Fawzeyah Abdullah Alshehri, [(2)] Ebtesam Abd El-Hamid El-Bestawy

[(1)] Department of Biological Sciences, Faculty of Sciences, King Abdulaziz University, Jeddah 21589, Saudi Arabia.
Email: nzabermawi@Kau.edu.sa, Phone: +966505658458
ORCID: https://orcid.org/ 0000-0003-1216-7003

Email: foz.ab.ash@gmail.com, Phone: +966560088056

[(2)] Department of Environmental Studies, Institute of Graduate Studies and Research, Alexandria University, 163 Horria Ave. El-Shatby, P.O. Box 832, Alexandria, Egypt. Phone: +2/1224979468
E-mail: ebtesamelbestawy@alexu.edu.eg,
ORCID: https://orcid.org/0000-0002-5351-9696

* *Corresponding Author*

ABSTRACT

- **Problem statement:** Phenol is one of the hazardous pollutants found in industrial wastewater. It is classified as a priority pollutant due to its toxic effects on animal and human health, as well as its widespread distribution and persistence in the environment.
- **Methods:** Wastewater samples from a petrochemical plant were collected from the industrial city, **Jeddah, Saudi Arabia**, during the study course. **Eight** pure indigenous bacterial isolates (**A1, A2, A3, A4, A7, A8, A9** and **A10**) were obtained from raw industrial effluent. They were screened for phenol degradation, and three strains (**A2, A4** and **A9**) showed the highest removal efficiency of phenol during the bioassay. Therefore, they were chosen and used as individual or mixed free-living cultures in an **8-day** batch mode remediation process. The characteristics of the wastewater included its **pH**, temperature, dissolved oxygen content (**DO**), total suspended solids (**TSS**), total dissolved solids (**TDS**), biochemical oxygen demand (**BOD**), chemical oxygen demand (**COD**), total viable count of bacteria (**TVC**), and phenol.
- **Results:** Extremely high **phenol removal** was achieved by all cultures tested, reaching **99.5**% by strain **A9** and the mixed culture, which was almost constant **throughout** the experiment duration. Also, high **BOD** and **COD** removal (**78.94** and **82.8**%) were achieved by **A9** and the mixed culture, respectively. However, levels of **TDS** and **TSS** increased in the treated effluent (**1811** and **1200**%) by strains **A4** and **A9**, respectively. The current study's findings confirmed that the proposed treatment system using the selected cultures, Strain **A9**, in particular, is a highly active, promising, renewable, and inexpensive biotechnology for the treatment of a wide range of contaminated industrial wastewater.

- **Conclusion:** Biological remediation using phenol degrading- bacterial biofilter is highly effective, low-cost, and readily available technology for phenol removal. The use of bacteria for the biodegradation of toxic pollutants presents an attractive chance to decontaminate the environment, produce high quality effluents, compiling with the environmental regulations for the safe drainage into open environment.

Key Words: Bacteria, Batch Mode, Bioremediation, Free-Living, Industrial Wastewater, Phenol