

## **Analysis of Polychlorinated biphenyl and identification of biphenyl metabolizing microbes in e-waste contaminated soils from Pakistan**

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### **Abstract**

In current study e-waste contaminated soils from Rawalpindi, Quetta and Peshawar cities of Pakistan were collected and analyzed to check the concentration of PCBs and their microbial degradation rate under aerobic and anaerobic conditions. Total 24 PCB congeners (PCB28/31, PCB17/18, PCB33, PCB52, PCB49, PCB44, PCB74, PCB70, PCB95, PCB101, PCB99, PCB87, PCB110, PCB82, PCB105, PCB118, PCB151, PCB149, PCB156, PCB153/132, PCB128, PCB138, PCB158 and PCB169) were analyzed. Soil physicochemical properties were determined in which Quetta soil was found loam, however in other sites soil was sandy loam. OM was also higher for all sites. Nitrate and phosphate contents were lower for all sites. Potassium contents were marginal for all the sites. The trends of PCBs concentration among different sites were: Quetta> Peshawar>Rawalpindi. Peshawar showed highest PCBs removal efficiency after 80 days as compared to the other sites during anaerobic soil condition. The removal efficiency of total PCBs was 46.69% at Peshawar after 80 days. During aerobic condition lower chlorinated PCBs showed more degradation results in complete mineralization of PCBs. The bacterial species found in soil were *Pseudomonas aeruginosa* gene for 16S ribosomal RNA, *Bordetella avium 197N*, *Enterobacter sp. GB27* 16S ribosomal RNA gene, *Bacillus safensis strain S8* 6S ribosomal RNA gene. The qPCR results showed that under sequential flooded conditions, the abundance of bphC and bphA gene carriers experienced a gradual decline during the flooded periods. The bphC and bphA gene expressed during the aerobic soil condition and were the main reason of low chlorinated PCBs degradation. *Chloroflexi* and *Pseudomonas spp.* expression was more during the anaerobic soil condition. These microbes were dechlorinated and attach on the higher chlorinated PCBs. In this project it was further concluded that Pakistani soils from different geographic location and climatic condition have the capability to degrade the e-waste pollutants.

**Keywords:** Microbial degradation, Polychlorinated biphenyl, Anaerobic, Aerobic, Physicochemical, Dechlorination