Moumita Chakraborty

G. B. Pant University of Agriculture & Technology
India

Elicitation of E-waste (acrylonitrile-butadiene styrene) enriched soil bioremediation and detoxification using Priestia aryabhattai MGP1

Abstract:

In current digital era, managing e-waste has become universal concern. From the viewpoint of persisting lacuna of e-waste managing methods, the current study is designed to fabricate an eco-friendly e-waste treatment with native soil bacteria employing an enrichment culture method. In the presence of e-waste, indigenous soil microbes were stimulated to degrade e-waste. Microbial cultures were isolated using enrichment medium containing acrylonitrile-butadiene styrene (ABS) as the primary carbon source. Priestia aryabhattai MGP1 was found to be the most dominant e-polymer degrading bacterial isolate, as it was reported to degrade ABS plastic in disposed-off television casings. Furthermore, to increase degradation potential of MGP1, Response Surface Methodology (RSM) was adopted which resulted in optimized conditions (pH 7, shaking-speed 120 rpm, and temperature 30 ◦ C), for maximum degradation (18.88%) after 2 months. The structural changes induced by microbial treatment were demonstrated by comparing the findings of Field emission scanning electron microscopy (FESEM) images and Fourier Transform Infrared (FTIR) spectra confirming the disappearance of ◦ C◦ H peaks along with C–H, C=C and C ◦ N bond destabilization following degradation. Energy-dispersive X-ray (EDX) analyzers of the native and decomposed e-polymer samples revealed a considerable loss in elemental weight % of oxygen by 8.4% and silica by 0.5%. Magnesium, aluminium and chlorine which were previously present in the untreated sample, were also removed after treatment by the bacterial action. When seeds of Vigna radiata were screened using treated soil in the presence of both e-waste and the chosen potent bacterial strain, it was also discovered that there was reduced toxicity in terms of improved germination and growth metrics as a phytotoxicity criterion. Nanoparticles were applied to investigate its effect on the biodegradation ability of the best suited bacterial strain.

Biography

Moumita Chakraborty, Ph.D., is an alumna of G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand; having completed her doctoral studies in Environmental Science in 2023. Her research focused on "In-vitro studies on nanoparticle-mediated biodegradation of electronic waste by native bacteria," shedding light on innovative solutions to tackle the pressing issue of electronic waste management. With a background spanning four years in research and development, Moumita has honed her expertise in a myriad of analytical techniques, including UV-spectrophotometry, FTIR, and FESEM-EDX. Currently serving as a Senior Environment Executive at Kryfs Power Components Ltd., Moumita leads with passion and dedication in a project under the RDSS scheme, generously funded by the esteemed Asian Development Bank.