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Chapter 4

Augmenting Polythene Degradation Potential in Bacteria Using Physical Mutagens

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Abstract:

Plastic pollution, particularly from polythene, poses a severe environmental challenge due to its recalcitrant nature and resistance to natural degradation. Microbial degradation has emerged as a promising eco-friendly solution, yet the efficiency of native bacterial strains remains limited. This study investigates the enhancement of polythene degradation potential in bacterial species through exposure to physical mutagens. Selected bacterial isolates were subjected to mutagenic treatments such as ultraviolet (UV) radiation and gamma irradiation to induce genetic variability. Mutant strains were screened for improved biodegradation efficiency using weight reduction assays, Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) to assess structural changes in polythene films. Results demonstrated that mutagenized strains exhibited significantly higher degradation rates compared to their wild-type counterparts, with notable alterations in surface morphology and chemical bond breakdown. The findings highlight the potential of physical