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Optimization and degradation of chloroxylenol by free and immobilized *Klebsiella pneumoniae* D2

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Two samples from phenol contaminated soil and waste water were collected for the isolation of bacteria degrading chloroxylenol. Out of eleven isolates, isolate D2 was the most promising showing a degradation efficiency of 19.9%. The selected isolate was identified using 16S rDNA analysis as *Klebsiella pneumoniae* D2. Statistical designs were applied to optimize the medium composition and cultural conditions in favor of increasing the degradation efficiency of *K. pneumoniae* D2. The Plackett-Burman design was applied to determine the significant factors affecting chloroxylenol degradation. The degradation efficiency increased to 30.56%. Box-Behnken design was adopted to further investigate the mutual interactions between the variables and to identify their optimal values that would generate maximum chloroxylenol degradation. Under the optimized medium composition and culture conditions, *K. pneumoniae* D2 degraded 55.7% chloroxylenol after 24 hrs. Bacterial cells were adsorbed on different solid supports. The results showed that the degradation efficiency increased up to 88.3% on using 20 cubes of polyurethane foam. The degradation efficiency decreased by 10% on reusing adsorbed cells of *K. pneumoniae* D2 on polyurethane foam, upto 10 cycles. Immobilization accelerated the degradation. The time was reduced to nine hours reaching a degradation of 88.3% compared to free cells.

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