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Bioremediation of acrylonitrile using bacterial isolates from soil and water

Nitriles are a widely used industrial commodity chemical, possibly a carcinogen and neurotoxicant. The extensive use of nitriles resulted in environmental contamination. Indeed, certain bacteria possess the capability to degrade nitriles. In the current research, we have reported the isolation, identification, and characterization of potent acrylonitrile-degrading bacteria isolated from soil and lake water. The bacterial isolates DSIS3 and DSIL2 demonstrated robust growth when exposed to acrylonitrile up to a concentration of 1.0% (V/V) and 0.7% (V/V), respectively. They showed Nitrile hydratase (Nhase) activity upon the addition of ϵ -caprolactam as an inducer. The isolate DSIS3 was identified as *Pseudomonas aeruginosa*, and DSIL2 was identified as *Bacillus cereus* through morphological, biochemical tests and 16S rRNA sequence analysis. The strains effectively degraded the acrylonitrile to acrylamide, subsequently converting it to acrylic acid while releasing ammonia in 24 to 48 hours. *Pseudomonas aeruginosa* DSIS3 hydrolyzed the other nitriles, with the order of degradation being acetonitrile > acrylonitrile > benzonitrile > valeronitrile. The adaptability of this bacterium in hydrolyzing various nitriles makes it a promising biocatalyst for organic synthesis or biotransformation and the bioremediation of toxic nitriles from the environment.

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