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## JOURNAL PUBLICATIONS

1. Tiwari, S.; Tripathi, P.; Mohan, D.; Singh, R. S. Imidacloprid Biodegradation Using Novel Bacteria *Tepidibacillus Decaturensis* Strain ST1 in Batch and in Situ Microcosm Study. *Environmental Science and Pollution Research* 2022, Elsevier (I.F.-5.19)  
<https://doi.org/10.1007/s11356-022-24779-8>
2. Tiwari, S.; Tripathi, P.; Mohan, D.; Singh, R. S. Bioremediation of imidacloprid in stirred tank reactor using bacterial consortium: Kinetic analysis and toxicity assessment. *Industrial and Engineering Chemistry Research*, ACS (I.F.- 4.33)  
<https://doi.org/10.1021/acs.iecr.3c01125>

# APPENDIX - I

## **Isolate:**

A bacterial isolate refers to a single species or strain of bacteria that has been isolated from a complex microbial community, such as soil, water, or a biological sample, using suitable media. Once isolated, bacterial isolates can be studied to understand their potential roles in various biological processes such as bioremediation, and industrial applications. The significance of a bacterial isolate lies in its potential to provide valuable insights and applications in various fields, serving as indispensable tools for advancing scientific knowledge and harnessing the potential of microorganisms for beneficial purposes.

## **Consortium:**

A bacterial consortium refers to a community of multiple bacterial species or strains that coexist and interact within an environment. A consortium comprises of more than one type of bacteria that may exhibit diverse metabolic capabilities and physiological characteristics. Bacterial consortia are crucial for environmental remediation, as their collaborative abilities lead to faster and more thorough contaminant degradation compared to traditional methods. They offer cost-effective, environmentally friendly solutions, making them indispensable in pollution mitigation and site restoration efforts.

## **Acute toxicity:**

Acute toxicity refers to the adverse effects caused by a single or short-term exposure to a substance or agent within a relatively brief period, usually lasting up to 24 hours or less. The severity of acute toxicity can range from mild and reversible effects to severe and life-threatening outcomes, depending on factors such as the dose, duration of exposure, route of exposure, and individual susceptibility. Acute toxicity assessments are crucial for human health, environmental safety, and regulatory decisions. They provide essential data on the immediate hazards of chemicals, contributing to safer products, healthier communities, and sustainable environmental stewardship.

## **Chronic toxicity:**

Chronic toxicity refers to the adverse effects that result from long-term or repeated exposure to a substance or agent over an extended period, typically spanning weeks, months, or years. Chronic toxicity assessment is crucial for understanding the health risks of prolonged exposure to toxic substances. By identifying long-term hazards and setting exposure limits, these studies contribute to safer products, healthier environments, and better public health outcomes. They play a critical role in assessing health risks, ensuring regulatory compliance, and safeguarding environmental health and biodiversity.

**Microbiome:**

The microbiome refers to the diverse community of microorganisms, including bacteria, viruses, fungi, and archaea, that inhabit a particular environment. In metagenomics, the microbiome's genetic diversity aids in understanding microbial ecology and its implications for various fields. Additionally, the diverse microbial communities in a microbiome play a vital role in bioremediation, offering a cost-effective and eco-friendly approach to restoring contaminated sites and protecting human health and ecosystems.

**Bioaccumulation:**

Bioaccumulation refers to the gradual accumulation of substances, such as pollutants or toxins, in living organisms through various pathways, including ingestion, inhalation, and skin contact. Bioaccumulation occurs when organisms absorb substances from their environment, leading to adverse effects on individuals and ecosystems. In bioremediation, bioaccumulation enhances the removal of contaminants by harnessing the abilities of organisms. This process contributes to environmental protection and restoration.

Bioremediation, on the other hand, involves using biological processes to degrade or remove contaminants from the environment. This approach is environmentally friendly and cost-effective, utilizing microorganisms, plants, or enzymes to break down toxins. While bioaccumulation concerns the buildup of contaminants in organisms, bioremediation focuses on reducing environmental contamination.

**Biostimulation:**

Biostimulation is a bioremediation strategy that enhances the metabolic activity of native microorganisms in contaminated environments to accelerate the degradation of pollutants. It involves introducing nutrients to stimulate the growth of existing microbial populations, providing a cost-effective and sustainable approach to remediation. The importance of biostimulation lies in its effectiveness, affordability, and environmental sustainability in restoring contaminated sites and improving environmental quality. Bioremediation, on the other hand, is a broader term encompassing various techniques to degrade, detoxify, or remove contaminants from the environment. It includes both biostimulation and bioaugmentation strategies. Bioaugmentation involves introducing specific microbial strains to enhance degradation, while biostimulation focuses on boosting the activity of indigenous microbes. While both are vital in environmental remediation, biostimulation specifically targets enhancing native microbial activity without introducing external microbial populations.

**Library size overview:**

In the context of molecular biology, particularly in genomics and metagenomics, a "library" refers to a collection of DNA fragments that have been prepared for sequencing or other downstream analyses. The term "library size" refers to the total number of DNA fragments within this collection. In metagenomics, the term "library size" typically refers to the total number of DNA fragments or sequences that are generated and used for downstream analysis. Library size is crucial in genomics and metagenomics because it affects sequencing depth, sensitivity, and data quality. Optimizing library size ensures reliable, informative, and cost-effective sequencing results, making it essential for molecular biology research.

**Dendrogram:**

A dendrogram is a tree-like diagram used to represent the arrangement of clusters in hierarchical clustering analysis or the results of hierarchical clustering algorithms. It visualizes the relationships between data points or groups based on their similarity or dissimilarity. Dendrograms are widely utilized in biology, ecology, bioinformatics, data mining, and social sciences to visualize relationships among entities. In metagenomics, they help illustrate connections between microbial communities, aiding in understanding diversity across environments.

**Metagenomic study:**

Metagenomics is a field of study within molecular biology that involves the genomic analysis of microbial communities found in various environments. Traditional genomic analysis typically involves isolating and culturing individual microbial species, but many microorganisms cannot be cultured in a laboratory setting. Metagenomics overcomes this limitation by directly extracting DNA from an environmental sample, which contains genetic material from all microorganisms present in that sample, including those that cannot be cultured.

The main goal of metagenomics is to understand the composition, structure, and function of microbial communities within their natural environments. Metagenomic studies can provide insights into microbial diversity, metabolic pathways, interactions between microorganisms, and their roles in various ecosystems.

Metagenomic studies offer crucial insights into the composition and dynamics of microbial communities and their implications for human health, biotechnological applications, and environmental science. These investigations uncover microbial diversity, genetic elements, and potential biotechnological and medical uses. Metagenomics plays a pivotal role in environmental monitoring, pollution detection, and bioremediation strategies. Metagenomics is significant for deepening our understanding of the ecological roles of microbial ecosystems and for fostering innovation and discovery across interdisciplinary domains.

**Genome:**

A genome is the complete set of genetic material (DNA in most organisms, RNA in some viruses) present in an organism. It contains all the information necessary for that organism's development, growth, functioning, and reproduction. The genome is crucial in bioremediation for understanding microorganisms' ability to degrade pollutants. It helps develop innovative strategies, improve pollutant removal, and predict bioremediation performance for environmental cleanup and restoration.

**Genotypes:**

Genotypes refer to the genetic makeup of an organism, which includes the specific alleles (variant forms of genes) present at particular loci (positions) within its genome.

**Bioluminescence inhibition:**

Bioluminescence is the production and emission of light by living organisms as a result of biochemical reactions occurring within their cells. This phenomenon is found in a diverse array of organisms, including some species of bacteria, fungi, protists, marine invertebrates and even a few terrestrial insects. The process of bioluminescence involves a light-emitting molecule called luciferin, an enzyme called luciferase, and oxygen. Luciferin undergoes a chemical reaction catalyzed by luciferase in the presence of oxygen, leading to the release of energy in the form of light.

Bioluminescence inhibition assays offer rapid toxicity assessments for environmental monitoring and risk management. In toxicity studies, bioluminescence inhibition assays are employed to measure changes in light emission following exposure to potentially toxic substances. The inhibition of bioluminescence serves as an indicator of the toxicity of the test compounds. While bioluminescence itself is not directly involved in the bioremediation process, it can serve as a valuable tool for tracking and evaluating the effectiveness of bioremediation strategies.

**Soil microcosm:**

A soil microcosm is a small-scale laboratory simulation of a natural soil ecosystem, designed to study various ecological processes and interactions under controlled conditions. These microcosms typically consist of soil samples collected from a specific environment, along with the associated microbial community, plant material, and other relevant components.

The soil microcosm is a valuable tool for investigating complex soil-related phenomena. Scientists can manipulate environmental factors to simulate different conditions and study their effects on soil processes and microbial communities. Soil microcosms play a significant role in bioremediation research, providing controlled environments to study the degradation of contaminants by microbial communities and develop effective strategies for restoring contaminated sites.

**Phylogenetic tree:**

A phylogenetic tree, also known as an evolutionary tree or cladogram, is a diagrammatic representation of the evolutionary relationships among a group of organisms or genealogical

relationships based on similarities and differences in their genetic, morphological, or biochemical characteristics.

Phylogenetic trees are crucial in bioremediation studies for identifying pollutant-degrading microorganisms, predicting degradation pathways, and optimizing bioremediation strategies. By analyzing the evolutionary relationships and functional diversity of microbial communities, phylogenetic trees inform the selection of effective biodegraders, leading to more efficient and targeted cleanup efforts in contaminated environments.

**Apoptosis induction:**

Apoptosis or programmed cell death, is a fundamental biological process essential for the development, homeostasis, and maintenance of multicellular organisms.

Apoptosis induction refers to the process of initiating programmed cell death in a cell or a population of cells. Apoptosis induction due to pesticides can occur when these chemicals interfere with cellular processes and signaling pathways.