Nitroglycerin (NG) is a toxic explosive commonly found in soil and contaminated groundwater at old manufacturing plants and military ranges. When NG enters an aquifer, it behaves as a dense non-aqueous phase liquid (DNAPL). Nitroglycerin is an impact sensitive explosive and therefore excavating the area to remove or treat the contaminant can be dangerous. In situ bioremediation and natural attenuation of NG have been proposed as remediation alternatives and it is therefore necessary to understand the degradation mechanisms of NG in contaminated soil and groundwater and investigate the potential for using bioremediation at contaminated sites. Many bacteria have been isolated for the ability to transform NG as a source of nitrogen, but no isolates have used NG as a sole source of carbon, nitrogen, and energy. We isolated Arthrobacter JBH1 from NG contaminated soil by selective enrichment with NG as the sole growth substrate. The degradation pathway involves a sequential denitration to 1,2-dinitroglycerin (DNG) and 1-mononitroglycerin (MNG) with simultaneous release of nitrite. Flavoproteins of the Old Yellow Enzyme (OYE) family capable of removing the first and second nitro groups from NG have been studied in the past and we identified an OYE homolog in JBH1 capable of selectively producing the 1 MNG intermediate. To our knowledge, there is no previous report on enzymes capable transforming MNG. Here we show evidence that a glycerol kinase homolog in JBH1 is capable of transforming 1 MNG into 1-nitro-3-phosphoglycerol, which could be later introduced into a widespread pathway, where the last nitro group is removed. Overall, NG is converted to CO2 and biomass and some of the nitrite released during denitration is incorporated into biomass as well. As a result, NG can be now considered a growth substrate, which changes the potential to bioremediate NG contaminated sites. The magnitude of the effect of biodegradation processes in the fate of NG in porous systems was unknown, and we have been able to quantify these effects, determine degradation rates, and have evidence that bioaugmentation with Arthrobacter sp. strain JBH1 could result in complete mineralization in contaminated soil and sediments contaminated with NG, without the addition of other
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Experiments were conducted to investigate NG degradation at various pH values and NG concentrations, and the effects of common co-contaminants on NG degradation rates. Arthrobacter JBH1 was capable of growing on NG at pH values as low as 5.1 and NG concentrations as high as 1.2 mM. The presence of explosive co-contaminants at the site such as trinitrotoluene and 2,4-dinitrotoluene lowered NG degradation rates, and could potentially result in NG recalcitrance.

Collectively, these results provide the basis for NG bioremediation and natural attenuation at sites contaminated with NG without the addition of other sources of carbon. Nonetheless, careful attention should be paid to site-specific conditions that can affect degradation rates.

An authoritative account of the application of fungi to the treatment of environmental pollution.

Scientific Study from the year 2016 in the subject Agrarian Studies, grade: 1.5, Mar Augusthinose College, language: English, abstract: Glyphosate (N-phosphonomethylglycine) is a herbicide that is used worldwide. Its common trade name is Roundup. Its non-targeted species action makes it most popular herbicide. It was developed by Monsanto company. The primary target for glyphosate is the enzyme EPSPS (5-enolpyruvoylshikimate 3-phosphate synthase). When glyphosate binds to EPSPS it forms a very stable complex that essentially permanently disables the enzyme and hence affect the metabolic activity of the plant and results in its death. Finding Glyphosate degrading microorganisms from soil is an interesting topic since glyphosate is non-targeted in its toxicity. Microorganisms were isolated from soil samples, which were then identified by molecular method. Isolation of DNA, its amplification using 16s rRNA gene and its sequencing are the major steps involved. Bioinformatics tool helps to identify the microorganisms. Two microorganisms identified are Pseudomonas sp. and Achromobacter sp. In the phylogenetic analysis also the two organisms are grouped as separate clades. In these, strain 1 showed highest growth in the Glyphosate containing medium than strain 2. These results show that the bacterial strain may possess potential to be used in bioremediation of glyphosate-contaminated environments.

Pollution has accompanied polar exploration since Captain John Davis' arrival on the Antarctic continent in 1821 and has become an unavoidable consequence of oil spills in our polar regions. Fortunately, many of the organisms indigenous to Polar ecosystems have the ability to degrade pollutants. It is this metabolic capacity that forms the basis for bioremediation as a potential treatment for the hydrocarbons that contaminate the pristine polar environments. The only book to cover the breadth of microbial ecology and diversity in polar regions with an emphasis on bioremediation, Polar Microbiology: The Ecology, Biodiversity, and Bioremediation Potential of Microorganisms in Extremely Cold Environments examines the diversity of polar microorganisms and their ability to degrade petroleum hydrocarbon contaminants in polar terrestrial and aquatic environments. Providing a unique perspective of these microorganisms in extremely cold temperatures, the book focuses on their taxonomy, physiology, biochemistry, population structure, bioremediation potential, and potential for biotechnology applications. Leading investigators in the field provide complete coverage of the microbiology relevant to the study of biodiversity and biodegradation of pollutants in the Arctic and Antarctic, including: Microbial extremophiles living in cold and subzero temperature environments Genetics and physiology of cold adaptation of microorganisms Biodegradative microbial consortia in a defined closed environment Molecular characterization of biodegradative microbial populations Molecular approaches to assess biodegradation of petroleum hydrocarbons Environmental impact of hydrocarbon contamination Microbial biodiversity across Antarctic deserts By bringing together the current state of scientific knowledge and research on microbial community structures in extremely cold temperatures, this thought provoking resource is the ideal starting point for the research that must be done if we are to effectively reduce human's eco-footprint on our polar regions.
Where To Download Bioremediation Potentials Of Bacteria Isolated From Advanced Technologies

Advanced technologies in the field of bioremediation and phytoremediation, including electro-bioremediation, microbial fuel cells, nano-bioremediation, constructed wetlands, phytotechnologies, and many more, which are lacking in other competitive titles existing in the market. The book includes updated information, as well as future directions for research, in the field of bioremediation of industrial wastes. This book is a reference for students, researchers, scientists, and professionals in the fields of microbiology, biotechnology, environmental sciences, eco-toxicology, environmental remediation, and waste management, especially those who aspire to work on the biodegradation and bioremediation of industrial wastes and environmental pollutants for environmental sustainability. Environmental safety and sustainability with rapid industrialization is one of the major challenges worldwide. Industries are the key drivers in the world economy, but these are also the major polluters due to discharge of potentially toxic and hazardous wastes containing various organic and inorganic pollutants, which cause environmental pollution and severe toxic effects in living beings. Introduces pollution and toxicity profiles of environmental contaminants and industrial wastes, including oil refinery wastewater, distillery wastewater, tannery wastewater, textile wastewater, mine tailing wastes, plastic wastes, and more. Describes underlying mechanisms of degradation and detoxification of emerging organic and inorganic contaminants with enzymatic roles. Focuses on recent advances and challenges in bioremediation and phytoremediation, including microbial enzymes, biosurfactants, microalgae, biofilm, archaea, genetically engineered organisms, and more. Describes how microbes and plants can be successfully applied for the remediation of potentially toxic industrial wastes and chemical pollutants to protect the environment and public health.

Biosurfactants are amphiphilic compounds i.e., they contain both hydrophilic and hydrophobic moieties which partition preferentially at the interfaces such as liquid/liquid, gas/liquid or solid/liquid interfaces. This facilitates properties like emulsification, foaming, detergency and dispersing. Their low toxicity and eco-friendly nature and the wide range of potential industrial applications in bioremediation, health care, food processing and oil industries makes them a highly useful group of chemical surfactants with respect to their biocompatibility, lower toxicity, higher biodegradability, higher stability, extreme stability in extreme temperature and pH with advent of time this attribute is contributing its higher demand in the field of biotechnology. This study focus on the screening production, extraction and purification of biosurfactant from bacteria isolated from petrochemical wastes and marine water and their chemical characteristics were elucidated. The antimicrobial activity of these biosurfactant was studied and their effect on lead remediation was also deliberated.

The need for exploration, conservation, and sustainable utilization of bioresources is undeniable for the survival and growth of mankind. This new book throws light on new and recent research on and development of effective strategies for sustainable utilization of bioresources using modern tools and techniques to help meet this challenge. This volume addresses the utilization of bioresources in therapeutics, in biofuel, in agriculture, and in environmental protection. Beginning with the diverse potential applications of bioresources in food, medicine, and cosmetics, the volume goes on to address the various different underutilized bioresources and their sustainable uses. It discusses important advances in biofuel and patents that highlight recent developments that address the energy crises and the continuously fluctuating cost of petroleum. It explores new renewable energy sources from bioresources and their sustainable utilization in the bioenergy and biofuel industry. Several chapters focus on the sustainable utilization of bioresources in the agricultural sector. The volume considers that developing countries have huge agricultural resources that could be employed for production of value-added byproducts for the sustainable development of a bio-based economy. The book discusses efficient use of underexploited natural bioresources, new chemical approaches for the generation of novel biochemicals, and the applications of genetics approaches for bioresource conservation and production of value-added products. Further, strategies for the production of biopesticides utilizing bioresources are also discussed.

Oil spills can introduce potentially carcinogenic pollutants, such as polycyclic aromatic hydrocarbons (PAHs), into coastal environments. Bioremediation uses the natural microorganisms in the environment for the treatment of these pollutants. This technology has the potential to break down petroleum hydrocarbons and other organic pollutants, which can be further enhanced by the use of genetically engineered organisms. This book focuses on the bioremediation of oil spills, including the use of microorganisms, enzymes, and biosurfactants in the remediation process. It provides an overview of the various technologies and methods used in bioremediation, as well as the challenges and limitations associated with this approach. The book also discusses the role of bioresources in the remediation of other types of pollutants, such as heavy metals and industrial chemicals. It is a valuable resource for researchers, students, and professionals in the fields of biotechnology, environmental science, and agriculture.
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Traditional studies of these organisms are limited in the types of bacteria isolated due to the limitations of traditional culturing methods. In this study, diffusion chambers were used to culture and isolate potential PAH degrading bacteria from the coastal sediment obtained from the Chandeleur Islands. The diffusion chambers trapped bacteria in agar that contained 1 ppm benzo[a]pyrene. The bacteria were isolated from the diffusion chambers, and the 16S rRNA gene was sequenced to identify the bacteria. Seven unique bacteria isolates were obtained and were found to be genetically similar to bacteria from the Bacteroidetes and Alphaproteobacteria phyla. It was concluded that the diffusion chamber approach provided an environment that promoted the growth of potential PAH degrading bacteria. Exploration in the use of diffusion chambers should continue in research of PAH biodegradation and the uncultivability of microorganisms.

Microbial Biodegradation and Bioremediation brings together experts in relevant fields to describe the successful application of microbes and their derivatives for bioremediation of potentially toxic and relatively novel compounds. This single-source reference encompasses all categories of pollutants and their applications in a convenient, comprehensive package. Our natural biodiversity and environment is in danger due to the release of continuously emerging potential pollutants by anthropogenic activities. Though many attempts have been made to eradicate and remediate these noxious elements, every day thousands of xenobiotics of relatively new entities emerge, thus worsening the situation. Primitive microorganisms are highly adaptable to toxic environments, and can reduce the load of toxic elements by their successful transformation and remediation. Describes many novel approaches of microbial bioremediation including genetic engineering, metagenomics, microbial fuel cell technology, biosurfactants and biofilm-based bioremediation Introduces relatively new hazardous elements and their bioremediation practices including oil spills, military waste water, greenhouse gases, polythene wastes, and more Provides the most advanced techniques in the field of bioremediation, including insilico approach, microbes as pollution indicators, use of bioreactors, techniques of pollution monitoring, and more

Topics include: Vol.

Research Paper (postgraduate) from the year 2019 in the subject Agrarian Studies, course: Microbiology, language: English, abstract: Bifenthrin is an active synthetic pyrethroid (SPs) and its studies are less reported. Due to its increased neurotoxicity and possible carcinogenicity, use of bifenthrin is banned or restricted to use in several countries. However, it is extensively used in many developing countries mainly in the agriculture sector and household applications. Moreover, pyrethroids are generally considered as environmentally safe due to its spontaneous degradation in Sunlight but bifenthrin is most stable known pyrethroids, withstanding in soil for several months. Thus, the present study aims to explore a bacterial strain to degrade bifenthrin at the lab scale studies.
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This volume focuses on innovative bioremediation techniques and applications for the cleanup of contaminated media and sites. It includes quantitative and design methods that elucidate the relationships among various operational parameters, and waste chemistry that defines the cost effectiveness of bioremediation projects. It also presents numerical models.

Emerging Technologies in Environmental Bioremediation introduces emerging bioremediation technologies for the treatment and management of industrial wastes and other environmental pollutants for the sake of environmental sustainability. Emerging bioremediation approaches such as nano-bioremediation technology, electro-bioremediation technology, microbial fuel cell technology, Modified Ludzack-Ettinger Process, Modified Activated Sludge Process, and phytotechnologies for the remediation of industrial wastes/pollutants are discussed in a comprehensive manner not found in other books. Furthermore, the book includes updated information as well as future directions for research in the field of bioremediation of industrial wastes. This book will be extremely useful to students, researchers, scientists and professionals in the field of microbiology and biotechnology, Bio (chemical) engineers, environmental researchers, eco-toxicology, and many more. Includes the recovery of resources from wastewater Describes the importance of microorganisms in environmental bioremediation technologies Points out the reuse of treated wastewater through emerging technologies Pays attention to the occurrence of novel micro-pollutants Emphasizes the role of nanotechnology in pollutant bioremediation

Eleven Total Petroleum Hydrocarbons (TPH)-degrading bacteria were successfully isolated from six inocula obtained from Seria Crude Oil Terminal (SCOT) plant in Brunei Darussalam using selective enrichment technique. All isolates were cultivated in liquid media with crude oil as the sole carbon and energy source. The nucleotide sequences of the 16S rRNA gene of these bacteria were determined. Based on biochemical and molecular characterization performed, the identities of the bacteria capable of degrading hydrocarbons belong to the genus Bacillus, Brevibacillus, Pseudomonas, Agrobacterium and Stenotrophomonas. All these isolates were assessed for their resistance against antibiotics like gentamicin, cephalexin, tetracycline, penicillin, erythromycin and vancomycin by mean of Kirby-Bauer disk diffusion method.

Bioremediation refers to the clean-up of pollution in soil, groundwater, surface water, and air using typically microbiological processes. It uses naturally occurring bacteria and fungi or plants to degrade, transform or detoxify hazardous substances to human health or the environment. For bioremediation to be effective, microorganisms must enzymatically attack the pollutants and convert them to harmless products. As bioremediation can be effective only where environmental conditions permit microbial growth and action, its application often involves the management of ecological factors to allow microbial growth and degradation to continue at a faster rate. Like other technologies, bioremediation has its limitations. Some contaminants, such as chlorinated organic or high aromatic hydrocarbons, are resistant to microbial attack. They are degraded either gradually or not at all, hence, it is not easy to envisage the rates of clean-up for bioremediation implementation. Bioremediation represents a field of great expansion due to the important development of new technologies. Among them, several decades on metagenomics expansion has led to the detection of autochthonous microbiota that plays a key role during transformation. Transcriptomic guides us to know the expression of key genes and proteomics allow the characterization of proteins that conduct specific reactions. In this book we show specific technologies applied in bioremediation of main interest for research in the field, with special attention on fungi, which have been poorly studied microorganisms. Finally, new approaches in the field, such as CRISPR-CAS9, are also discussed. Lastly, it introduces management strategies, such as bioremediation application for managing affected environment and bioremediation approaches. Examples of successful bioremediation applications are illustrated in radionuclide entrapment and...
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Where To Download Bioremediation Potentials Of Bacteria Isolated From retarded, soil stabilization and remediation of polycyclic aromatic hydrocarbons, phenols, plastics or fluorinated compounds. Other emerging bioremediation methods include electro bioremediation, microbe-availed phytoremediation, genetic recombinant technologies in enhancing plants in accumulation of inorganic metals, and metalloids as well as degradation of organic pollutants, protein-metabolic engineering to increase bioremediation efficiency, including nanotechnology applications are also discussed.

Bioremediation - the use of microorganisms for environmental clean-up - is a technology that is experiencing a rapid phase of development. From the opening chapter of Perspectives in Bioremediation, on the nature of environmental site assessment, on to the genetic manipulation of native soil microorganisms, the international collection of authors provide an understanding of the current progress and limitations of technologies that are designed to help nature herself. The book draws together many different aspects of environmental remediation: the environmental engineer is introduced to the bacteria of contaminated environments and the ideas developing from genetic engineering; the environmental microbiologist can grasp site assessment and the predictive kinetic analysis of potentials. The book provides a clear and concise introduction to the nature of and potential for bioremediation to contribute to a critical global effort in eliminating contamination of the world's resources and to start to reverse decades of environmental mismanagement and neglect.

Around the World, metal pollution is a major problem. Conventional practices of toxic metal removal can be ineffective and/or expensive, delaying and exacerbating the crisis. Those communities dealing with contamination must be aware of the fundamentals advances of microbe-mediated metal removal practices because these methods can be easily used and require less remedial intervention. This book describes innovations and efficient applications for metal bioremediation for environments polluted by metal contaminants.

This title discusses various effects of heavy metal exposure to legumes as well as the bioremediation potential of rhizosphere microbes. Availability of heavy metals, their uptake and the effects of metals on various signaling pathways within legumes are presented. Furthermore, the effects of heavy metals to nitrogen fixing microorganisms and how microsymbionts can overcome metal stress is presented in detail. The role of nitrogen fixers in decontamination of heavy metal toxicity, mycoremediation of metal contaminated soils, microbially mediated transformation of heavy metals and action of plant growth promoting rhizobacteria and nitrogen fixers together in detoxifying heavy metals are broadly explained. This volume is a useful tool for scientists, policy makers and progressive legume growers intending to develop safe and healthy legumes for future generations.

Microbes are the predominant form of life on the planet due to their broad range of adaptation and versatile nutritional behavior. The ability of some microbes to inhabit hostile environment incompatible with most forms of life means that their habitat defines the extent of the biosphere and delineates the barrier between the biosphere and geosphere. The direct and indirect role of microbes that include bacteria, fungi, actinomycetes, viruses, mycoplasma, and protozoans are very much important in development of modern human society for food, drugs, textiles, agriculture, and environment. Furthermore, microorganisms and their enzyme system are responsible for the degradation of various organic matters. Microbes for Sustainable Development and Bioremediation emphasizes the role of microbes for sustainable development of ecosystem. Environmental microbiology role in biogeochemical cycle and bioremediation of environmental waste is major theme, which comprises the following aspects: Bacterial phytoextraction mechanism of heavy metals by native hyperaccumulator plants from complex waste-contaminated site for eco-restoration Role of microbial enzyme for eco-friendly recycling of industrial waste Field-scale remediation of crude oil–contaminated desert soil and treatment technology Microbial technology for metal recovery from e-waste printed circuit board Impact of genomic data on sustainability of ecosystem Methane monooxygenases: their regulations and applications Role of microbes in environmental sustainability and food preservation This book will be directly beneficial to researchers and classroom students, in areas of biotechnology, environmental microbiology, molecular biology, and environmental engineering with specialized collection of cutting-edge knowledge.
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The book consists of 21 chapters by subject matter experts and is divided into four parts: Soil Microenvironment and Biotransformation Mechanisms; Synergistic effects between substrates and Microbes; Polyhydroxyalakanoates: Resources, Demands and Sustainability; and Cellulose based biomaterials: Benefits and challenges. Included in the chapters are classical bioremediation approaches and advances in the use of nanoparticles for removal of radioactive waste. The book also discusses the production of applied emerging biopolymers using diverse microorganisms. All chapters are supplemented with comprehensive illustrative diagrams and comparative tables.

This book will discuss the effective and sustainable technological approaches for remediation of contaminants via eco-friendly usage of microbes. The primary focus will be on the role of microbes, particularly bacteria and fungi, for the degradation and removal of various xenobiotic substances in the environment. The book will also emphasize molecular approaches and biosynthetic pathways of microbes, and present gene and protein expression studies for bio-deterioration techniques. New innovative and sophisticated green technologies for waste minimization and waste control will be presented, as well as the potential of microbes for various techniques of bioremediation, including bio-sorption, bio-augmentation, bio-stimulation, to clean contaminated environments.

Microbial enzymes play a vital role in maintaining soil health and removing pollutants from contaminated land. Soil microflora is closely associated with maintaining soil fertility, and the use of chemical pesticides, fertilizers and other volatile sprays in agriculture threatens the health of the microbial population in the soil. Every single particle of healthy soil contains millions of bacteria, which interact with the nutrients available, sustaining the nutrient cycle and making this microflora an essential component of life on earth. How do microbes help in the nutrient cycle? Either by intracellular digestion of macromolecules and converting these into smaller units in their metabolic pathways, or by secreting enzymes into the extracellular environment to facilitate the conversion of complex macromolecules into micro-molecules that can be easily absorbed by other living species. To meet demands for energy and food for the growing global population, it is important to protect agricultural land from contamination and maintain its productivity. Heavy metal ions from contaminated land can enter crops, fish or aquatic organisms via contaminated water, and these are then taken up by the human body, where they can accumulate and alter the normal microflora. The microbiological component of the soil is a highly complex system and is still not fully understood. How do microbes survive in the changing physicochemical environment of soil?. This book helps readers understand the mechanism, various routes of microbial soil remediation, the interactions of different genera, and how microbial enzymes support the sustainable restoration of healthy soil.

This text details the plant-assisted remediation method, "phytoremediation," which involves the interaction of plant roots and associated rhizospheric microorganisms for the remediation of soil contaminated with high levels of metals, pesticides, solvents, radionuclides, explosives, crude oil, organic compounds and various other contaminants. Each chapter highlights and compares the beneficial and economical alternatives of phytoremediation to currently practiced soil removal and burial practices.