FULL LENGTH ARTICLE

Polyamines and S-Adenosylmethionine Decarboxylase in plant stress response

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Polyamines (PAs) are positively charged aliphatic nitrogen-containing compounds of low molecular weight and are widely distributed in living organisms. In plant cells, the diamine putrescine (Put), triamine spermidine (Spd) and tetramine spermine (Spm) include the major PAs. They occur as free, conjugated and bound polyamines. Put is the first polyamine in the polyamine biosynthetic pathway, synthesized from two different precursors (arginine or ornithine). The higher polyamines are synthesized by the successive addition of aminopropyl group donated by decarboxylated S-Adenosyl Methionine (dcSAM). The aminopropyl groups are derived from methionine catalyzed by SAM decarboxylase (SAMDC, EC4.1.1.50). Polyamines take part in a wide range of processes (like cell division, embryogenesis, reproductive organ development, root growth, tuberization, floral initiation and development, fruit development, ripening etc.). Polyamines also have regulatory role in leaf senescence and abiotic stresses. The level of polyamines alters due to adaptation to stresses in a variety of plants. Due to external stress applied to the plant, overexpression or down-regulation of several genes involved in the polyamine pathway have been observed. The characterization and identification of biosynthetic genes of higher polyamines and the expression of these genes under different stressed condition, helped to understand the involvement polyamines in single or multiple stressed conditions.

Keywords: Polyamine, biosynthesis, S-adenosyl methionine decarboxylase (SAMDC), stress, gene regulation, gene characterization, expression.

INTRODUCTION

Among the different molecules that help plant in different metabolic processes, polyamines (PAs) are very important. They are positively charged (polycationic), aliphatic nitrogen-containing compounds of low molecular weight and are widely distributed in living organisms. Putrescine (Put), spermidine (Spd) and spermine (Spm) are the main three polyamines (PAs) that interact with nucleic acids, proteins and cell substructures and have regulatory role in plant growth and development. PAs have regulatory role on plant physiology including cell division, embryogenesis, reproductive organ development, root growth, tuberization, floral initiation and development, fruit development and ripening as well as in leaf senescence (Evans and Malmberg, 1989; Galston *et al.*, 1997; Bais and Ravishankar, 2002 and Tiburcio *et al.*, 2002).

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Water Pollution and Effect on Human Health

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Abstract:: Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels. It has been suggested that water pollution is the leading worldwide cause of deaths and diseases and that it accounts for the deaths of more than 14,000 people daily. An estimated 580 people in India die of water pollution related illness every day. Potable water is the type of water which is fit for consumption by humans and other animals. It is also called drinking water, in a reference to its intended use. Water may be naturally potable, as is the case with pristine springs, or it may need to be treated in order to be safe. The general population cannot afford packaged drinking water because of its expensiveness. Hence much of the population depends on the water supplied by the different Municipal Corporations. Aging infrastructure may have leaky sewage collection systems (pipes, pumps, valves), which can cause sanitary sewer overflows. If sewage water mixes with potable water, the result could be disastrous as seen in the recent outbreaks of diarrhoea reported from 10 wards in south Kolkata may have been triggered by a bacterial growth in the drinking water supplied by the Kolkata Municipal Corporation. One of the most common causes of diarrhoea is a lack of clean drinking water. Diarrhoea can be caused by many types of bacteria, viruses, and parasites. The present study focuses on different microorganisms (bacteria, viruses and parasites) that cause diarrhoea, their effect on human health and their preventive measures as well.

Keywords: Water Pollution, Potable Water, Diarrhoea.

Introduction

Microorganisms are present everywhere in our environment. Invisible to the naked eye, vast numbers of these microbes can be found in soil, air, food and water. Although humans are essentially free of microorganisms before birth, constant circumstances of exposure (e.g., breathing, eating and drinking) quickly allow the establishment of harmless microbial flora in our bodies. Waterborne diseases are typically considered to be those diseases resulting from ingestion of contaminated water. It has been suggested that water pollution is the leading worldwide cause of deaths and diseases and that it accounts for the deaths of more than 14,000 people daily [1]. An estimated 580 people in India die of water pollution related illness every day [2]. Potable water is the type of water which is fit for consumption by humans and other animals. It is also called drinking water, in a reference to its intended use. Since voluntary water ingestion (drinking water) and bathing are universal practices and accidental ingestion during recreational activities (e.g., swimming,

Flood Induced Migration and its Socio-economic Impacts: A Case Study in Rural West Bengal

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Abstract: West Bengal is counting as most flood prone state and Murshidabad district is one of the most common places of flood. Kandi block of Murshidabad district is count as heavy flood prone area. The massive river floods in the year 2000 caused unprecedented loss to lives, livelihoods, infrastructure and property in Kandi. Although floods are common issue in this area but the year 2000 floods were not usual. The flood burst in the year 2000 as such that had been not experienced such flooding for half a century.

Survey was conducted to document the experiences of affected household; explore the extent of damage at village and household levels; access to food, water and sanitation, health and education, and livelihoods; identify social changes, migration of people to different social and occupational groups. A total of 40 broadly representative villages were surveyed, as well as 1424 sample households, of which 476 respondents were women. Focus Group Discussions (FGDs) were held with people belonging to various social groups in 20 out of 40 villages, for our selection of study area and also for making scientific questionnaire.

The study found that affected households have to shift another place as people are homeless due to flood. They lose their agricultural field, crops which induce their poverty levels. To combat they need alternate earnings and they chose migration for their livelihood. The most common place to migration is Saudi Arabia and the migration to Arabian country was first initiated in Muslim community. After 6-8 month later the huge change was found among them that also encourage other religion community for migration. The study found huge economic development. People build pucca houses, making their own boating arrangement to cope up the flood situation so that a long and healthy life assured higher level of literacy rate and gross enrolment ratio in educational institutions along with increasing purchasing power of the average people. All these ensure human development in the study area.

Keywords: Flood, Migration, Socio-economic impacts, Murshidabad District, Kandi Block.



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Cyanobacterial Exopolysaccharide (EPS) Synthesis and Metal Sequestration by Biosorption

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Abstract: Cyanobacteria produce extracellular polymeric substances (EPS) that are mainly made by high-molecular-mass heteropolysaccharides, with variable composition and their roles depend on the microorganism and the environmental conditions. Cyanobacteria have the major roles to become an industrially important source of functional biopolymers. Their exopolysaccharides (EPS) consist of various types of chemical complexity, which predicts bioactive potential. Although some are reported to excrete large amounts of polysaccharides, others are still to be discovered. This review organizes available information on cyanobacterial EPS, including their composition, function and their heavy metal sequestration capacity . Compared to various types of conventional heavy metal removal methods, heavy metal removal by cyanobacteria is a potential method, as it is a low cost method, in situ operable, and simple chemistry related. They are excellent machines for operation of multidirectional metal sequestration as they can sequester metal simultaneously through biosorption and bioaccumulation. Biosorption is a cell surface method, whereas bioaccumulation occurs within the cell. This study reviewed how cyanobacteria are able to absorb heavy metal ions by these two methods from an ambient water body and the protective machinery of cyanobacteria against heavy metal-induced toxicity. Further, among the different components of the cyanobacteria's cell wall, this blue-green algae is able to absorb the metal ion mainly through Exopolysaccharide (EPS).

Keywords: Industrial Activity ,Mining ,Agricultural Activity, Sewage Water & Natural Activities.

Introduction:

Heavy metals are foreign particles that are able to deteriorate the surface and groundwater quality and are toxic at low concentrations [1,2]. Heavy metals have a high density (~5 g/cm3) and non-biodegradable [3], which transfer to receiving watershed by various processes such as industrial activity ,mining ,agricultural activity, sewage water and, natural activities (weathering and erosion of bedrocks) [4]. When these metals enter the aquatic system,

Biochemistry of Iron Metabolism : An Overview

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Abstarct: Iron is required for physical growth, neurological development, cellular functioning, and synthesis of some hormones. It is a component of haemoglobin and myoglobin. Maximum part of iron is found in haemoglobin and some are stored in liver, spleen, bone marrow and also in myoglobin. Transferrin helps its transport and hepcidin is responsible for iron absorption all through the body. The recommended intakes of iron vary with age and gender. From infancy to adult the range varies from 0.27mg to 27mg. Many foods are there like nuts, vegetables and many more that contain non-heme iron only whereas meat, seafood, poultry possess both heme and non-heme iron. Upper limits of iron both in male and female is 40mg/day and in case of pregnancy and lactation period it is 45mg/day. The World Health Organization (WHO) estimates that worldwide approximately half of the 1.62 billion cases of anaemia are due to iron deficiency. Iron deficiency leads to iron deficiency anaemia (IDA), which causes neoplastic diseases characterised by low hemoglobin concentrations, and decreases in haematocrit. On the other hand, overdoses of iron leads to multi-organ failure, convulsions, coma and even death. Iron has the ability to interact with many other elements such as N, Mn, Cu, with light energy, etc. It has been suggested, serum ferritin concentration lower than 30 mcg/L indicates iron deficiency, and a value lower than 10 mcg/L indicates IDA.

Keywords: Homeostasis, Hepcidin, Iron, Ferroportin, IDA

Introduction : In nature elements are present in different forms, which are very much essential to perform different functions of the body. To perform important cellular functions at biological, chemical and molecular levels, trace elements play pivotal role [1]. Trace elements refers to "elements that occurs in natural and perturbed environments in small amounts and that, when present sufficiently bioavailable concentrations are toxic to living organism" [2]. These elements act as cofactors for many different enzymes, also responsible for stabilizing the structures of enzymes and proteins, control important biological processes by binding to the molecules on the receptor site of cell membrane, sometimes alternate membrane structure to prevent entry of specific molecules into the cell. Through different analytical methods these trace elements which have clinical significances can be estimated [1]. All over the earth crust, iron is found in large quantities and also available from plants to a great extent. Among all the trace elements, iron plays a crucial role at all levels of functions in the human body. Atomic

Creating an Inclusive Environment for the Transgender Students at School Level: Challenges and Formation of Strategies in West Bengal

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Abstract: The transgender community is one of the vulnerable and marginalized communities in India and seriously lagging behind on human development indices including education. Victimization caused by ignorance of the parents, teachers, school staffs and peers is causing serious negative impact on the mental health of transgender students. This results in a high drop-out rate at the school level. The same scenario has been observed in West Bengal. This paper aims at creating inclusive classrooms for transgender students in West Bengal. It also tries to highlight the challenges and formation of strategies to build school as a safe and welcoming place for them.

Keywords: transgender, community, inclusive, classroom.

Introduction

The term "Transgender" signifies different meanings to different people. It is an umbrella term referring to people who do not conform to culturally defined traditional gender roles associated with their biological sex (Lindsay, 2016). 'Transgender' is a less clinical term which does not include sexual orientation or physical sex characteristics; rather it pertains to gender identity and gender expression. The life of transgender people in India is a daily battle of acceptance. They are shunned and often ridiculed by the society (Rajkumar, 2016).

Indian Census 2011 data reveals that there are around 4.9 lakh transgender in the country. According to the Census 2011, this community has very low literacy rates, only 46% transgender are literate (Rajkumar, 2016). There live 30,349 transgender in West Bengal i.e. 6% of the whole population.

In April 2014, the Supreme Court of India in its landmark judgement passed the ruling that "In view of the constitutional guarantee, the transgender community is entitled to basic rights i.e. Right to Personal Liberty, dignity, Freedom of expression, Right to Education and Empowerment, Right against violence, Discrimination and exploitation and Right to work. Moreover, every person must have the right to decide his/her gender expression and identity, including transsexuals, transgender, hijras and should have right to freely express their gender considered as a third sex." In the Constitution of India, 'Right to Education' is

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Plagiarism: prevention and Cure

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Abstract: The use of the internet has brought the world to our doorsteps, and the popularity of androids has brought crime to our fingertips. The world is now called the "global village," and we people are global citizens of this village. Information is spread in every corner of the world, and we have to get access to each one. The Google Search Engine provides us with thousands of open-access databases with a single search through its vast database. An information seeker downloads his or her desired information and uses a copy and paste facility to complete his or her assignments. Everyone believes that open access resources are completely open to all and that they should be used as their own. In this way, we fall victim to plagiarism. Intellectual property rights (IPRs) protect intellectual property (IP) such as literary works, art forms, patents, inventions, industrial designs, trademarks, etc. Literary works and artworks are protected by copyrights.

Plagiarism is a disease, dishonesty of the human mind. Plagiarism is when someone else's ideas, thoughts, creations, or work are taken without proper attribution or citation. Plagiarism is a disease of intellectual society that is curable. The article talks about how to prevent and cure this harmful disease.

Keywords: Plagiarism, Copyright infringement, Intellectual Property Rights (IPRs), Intellectual Property (IP), Digital Copyright Infringement (DCM), Information literacy and academic integrity etc.

Prologue

In the current era when online teaching-learning methods are established as direct teaching, plagtarism is augmented in its way. Plagtarism is a well-known word among academicians and is also known as a crime. But no one has a clear idea of it. Plagtarism is the stealing of intellectual property and is a criminal offense under the Intellectual Property Rights (IPR) Act. Before discussing plagtarism in detail, it should put some light on some terminology and try to define the concept behind it.

Intellectual property

The World Intellectual Property Organization (WIPO) defines intellectual property (IP) as creations or inventions of the mind. It is classified as literary and artistic works of the mind. Intellectual property is protected by the laws of patents, copyright, design, trademarks, etc.

Swami Vivekananda's Vision On Inclusive Society A Comprehensive Review

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Introduction

Social inclusion is the concept by which a socially cohesive society can be made where all groups will be given equal opportunities and everyone in society, regardless of their background, will get a sense of belonging, recognition, participation and legitimacy. Every individual with their own rights and responsibilities can achieve their full potential in life. Being a great social reformer many decades ago Swami Vivekananda had already dedicated his life to eradicate various social evils and he succeeded to create a national consciousness amongst all Indians of past and present time too. He travelled all over the country and identified himself with the people of different regions. He felt that there are some specific reasons that resist human progression. Those are education, poverty and casteism. He was the first reformer in modern India to speak for the poor. He believed that India cannot be fully uplifted unless or until the poor and downtrodden masses are given special attention to fulfill their basic necessities of life i.e., enough food, clothes and proper shelter. Swamiji embraced all kinds of people with equal importance without any distinction of caste, religion, race, gender and nationality. Swamiji has given a great message to mankind that the best form of worship is to see God in the poor, the downtrodden, and the ignorant people and to serve them. So the process of social inclusion was given more importance by Swami Vivekananda a long time ago. Swamiji believed that inequality, deprivation and poverty were not due to the different religious traditions but the exact reason is that the 'dharma' was not practiced properly, Scriptures had provided the examples of different glorious holy men and their lives dedicated to all people seeing divinity in them, yet the poor, the weak, the downtrodden were mercilessly set aside. What Swami Vivekananda believed is that the way to change society is two-fold. Firstly, the spiritual upliftment and secondly the widespread education of masses. Truth, purity and unselfishness are the three pillars on which a great noble society can be built.

Concept of Social Inclusion and exclusion:

Social inclusion is the process of making all groups of people within a society and giving equal opportunities to those people who are deprived in society and they will also be given certain equal rights in case of employment, housing, health care, education and training etc. so that with other groups they will get chance to flourish their abilities. 1995 Copenhagen





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Community Genomic and Transcription Analysis of Microbial Community in Soils Under Different Cropping Systems

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Abstract: Research on microbial ecology in recent years had shifted methodologically from traditional culture based techniques to culture independent molecular techniques. This is due to the fact that it has already been established that less than 1% of microbes in environmental samples are cultivable. We, in our study had applied communitygenomic (DNA based) and communitytranscriptomic (RNA based) approach to study microbial community and their activities in soils under different cropping system. Soil samples were collected from agricultural fields under different cropping system and analyzed for selected physico-chemical properties like pH, organic carbon, and total nitrogen content. Biochemical activities like selected soil enzyme activities and microbiological parameters like microbial biomass carbon, basal soil respiration were determined. Significant variation was observed among samples. For communitygenomic analysis of soil microbial diversity, community DNA was isolated directly from soil, PCR amplified with 16S rDNA specific primers and amplicons were cloned to generate sample specific ribotypic libraries. The library was manually screened by RFLP for different OTU (Operational taxonomic unit) and Shanon-Weaver Index was determined. Diversity among the samples were evident and were correlated with various assessed parameters. For communitytranscriptomic analysis, RNA was successfully isolated from soil samples, converted to1st stand cDNA which was subjected to RNA fingerprinting by RAP-PCR. Differential effect of cropping system on microbial expression profile was evident from sample specific fingerprints. Hence, it can be concluded that cropping system regulates microbial diversity and their expression profile in the under laying soils.

Keywords: Community genome, transcriptome, RFLP, DNA library, RAP-PCR

Introduction

Metabolic characteristics and diversity of soil microbial communities are known to be sensitive to soil management practices (Marx et al., 2001), and may also provide information on the status and activity of the microbial community in a particular environment. The great abundance and diversity of microorganisms in soil have high metabolic potentials. Classical culture based approaches to study microbial community structure and function in soil environment suffer from major drawbacks which includes uncultivable majority (1% culturable), obligate niche specificity and mutualistic co-existance. Culture independent

Impact of Amphan on Roadside Trees in Kolkata

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Abstract: The super cyclone Amphan wreaked havoc by uprooting a huge number of trees along with its track of travel. A large number of trees were uprooted in Kolkata which is primarily due to faulty tree selection and improper management of urban forestry and city beautification.

Keywords: Amphan, Uprooting Trees, Improper Management.

Introduction

Amphan was a super cyclone that originated from Bay of Bengal in May 2020 with the highest speed of 180-200—km/hr on landside area. Its' devastating winds heavily damaged the coastal areas of Digha, Sundarban, 24 Parganas as well as Kolkata and other district in West Bengal. The Kolkata Municipal Corporation stated that Amphan toppled 4000 electric poles and triggered widespread flooding around the city. Numerous trees on roadside, in the parks and garden were uprooted with broken branches because of the extreme severity of the cyclone. The damages were immense and the severity was such that it uprooted more than 15600 trees in Kolkata. So it is now imperative to understand why such huge number of trees fall due to the impact of a cyclone.

Method

A survey was done in different wards of Kolkata and different zones (Mouza) in Digha, Sundarban to witness the types of trees which were uprooted. The uprooted species that were recorded is tabulated in Table 1 with their local name, scientific name and family.

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SI No	Saigntiffe NI			
51.110.	Scientific Name	Common	Family	
1.	Figue benghalangia I	name		
2.	Figure religions L	Bot	Moraceae	
3.	Delonix regio (D-i) D a	Aswatha	Moraceae	
	Belonix Tegla (Bojer) Raf.	Gulmohar	Leguminosae	

Table 1. List Of Roadside Trees Uprooted During Amphan

A Review on Solvent Promoted Preparation of Mononuclear and Dinuclear Vanadium Complexes Having Hydrazone Moiety

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Abstract: A quick review on the chemistry of vanadium complexes with hydrazone functionalised moiety is reported herein inspired by our recent findings of the mononuclear oxidovanadium(V) complexes of type $[V^{V}O(L^{12})(OMe)(MeOH)]$ and dinuclear μ -oxidodioxidodivanadium(V) complexes of type $(L^{1-2})(O)V^{V}-O-V^{V}(O)(L^{1-2})$ where L¹ and L² are the dianionic forms of the conjugated keto-imine functionalized substituted hydrazone ligands. Relevant researches on various other mono and dinuclear oxovanadium complexes have been discussed briefly with respect to structure and coordination environment. A general solvent dependent synthetic strategy is established thereof for facile preparation of the corresponding mononuclear and dinuclear bridge complexes.

Keywords: Vanadium, Aroyl Hydrazone, Solvent Dependence, X-Ray Structure.

Introduction

Vanadium was first discovered by Andres Manuel del Rio in 1801 by analyzing a new leadbearing mineral called 'brown lead' and he named the new element erythronium (Greek for 'red') as most of its salts turned red upon heating. Nils Gabriel Sefstrom rediscovered the element in 1831 and he named it vanadium after the Scandinavian goddess of beauty and fertility Vanadis. It is a soft, ductile and greyish silvery metal found naturally in soil and seawater as trace metal. Vanadium has multiple biological roles, its coordination chemistry has provided an impetus in a variety of catalytic processes, ¹⁻⁴ biochemical processes such as peroxidase mimicking activity⁵, insulin mimicking activities, ⁶ cytotoxic activities, ⁷ nitrogen fixation,⁸ haloperoxidation, ⁹, epoxidation ¹⁰, inhibition of phosphate-metabolizing enzymes ¹¹, alleviation of diabetes mellitus symptoms ¹² and so on.

On the other hand, nitrogen-oxygen donor ligands, aroylhydrazones are a class of azomethines having the group -C=N-N- and are widely employed as ligands in coordination chemistry. These ligands are readily available and depending on the nature of the starting materials employed for their preparation, they can exhibit versatile denticities and functionalities. These types of ligands play crucial part in determining the range of applications due to easily tunable electronic properties, conformational diversity ¹³, widespread biological applicability ¹⁴, in determining the overall charge

Interpersonal Communication and Work Motivation of Teachers

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Abstract: Interpersonal communication plays a vital role on the work motivation of teachers of any educational institution. In the backdrop of every student's success story, there is a strong support of his/her teacher(s). He acts like a friend, philosopher and guide. But teachers are also human beings. They also need motivation to do his works effectively. A demotivated teacher fails to perform his duties inside the classroom as well as in the institution. As a result, it affects in the educational institutes' overall performance. The implication of correct interpersonal communication skills can increase the work motivation of teachers. The purpose of this paper is to understand the role of interpersonal communication in enhancing the work motivation of teachers. The narrative literature review methods are used for describing the role of interpersonal communication in enhancing the work motivation of teachers. All the data are secondary in nature and collected from different books, articles, e-journals, websites etc. In the beginning, this paper describes what is meant by interpersonal communication, employee motivation and then discusses how interpersonal communication skills impacts work motivation of teachers. The paper proposed with the fact that the effective interpersonal communication skills can enhance the work motivation of the teachers of different educational institutions.

Keywords: Interpersonal Communication, Interpersonal Communication Skills, Work Motivation, Teachers

Introduction

"Teacher is a maker of man. He is foundation of all Education, and thus of the whole civilization of mankind, present and future. No nation reconstruction is possible without the active cooperation of the teacher."- John Adams.

Teachers play an important role for society and nation building. He is like a friend, philosopher, guide and facilitator of the students today. A mentally, physically and emotionally prepared and skilled teacher will definitely disseminate a good quality of teaching. A skilled teacher can perform better only if he is motivated enough to his work. Every educational institute needs highly motivated teachers to achieve their goals and produce quality people of next generation.

Bioremediation- A Green Technology For Environmental Clean-Up

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Abstract: Global population is rising at an alarming rate, leading to huge scale anthropogenic pollution of air, water and soil. According the World Health Organization (WHO), around 7 million people are killed each year from the air they breathe. According to the EPA, Bioremediation is a "treatment that uses naturally occurring organisms to break down hazardous substances into less toxic or non-toxic substances." This technology deploys microorganisms and plants to acquire, detoxify, degrade or remove toxic environmental contaminants (organic chemicals, heavy metals, oil and inorganic pollutants), even when they are present in low concentration. Microorganisms play a pivotal role in bioremediation process in nature by degrading complex human, animal, and plant wastes so that life can continue from one generation to the next. Bioremediation can be done either - *in situ* i.e. at the site of the contamination itself, or *ex situ* i.e. away from the site. There are three categories of bioremediation techniques to eliminate contaminants from environment: *in situ* land treatment for soil and groundwater; biofiltration of the air; and bioreactors, predominantly for water treatment.

Keywords: Pollution, Contaminants, Bioremediation, Detoxification, Microorganisms

Introduction

Bioremediation is the process of remediating environment from waste pollution by using Bio-organisms. According to the EPA, Bioremediation is a "treatment that uses naturally occurring organisms to break down hazardous substances into less-toxic or non-toxic substances." Environmental pollution is increasing due to various reasons. So there is an urgent need to search for new eco-friendly, low-cost, and more efficient environmental clean-up techniques. Ability of microorganisms or plants to accumulate, detoxify, degrade, or remove environmental contaminants play a crucial role in bioremediation [1]. It is based on the ability of a microorganism as well as plants to degrade the hydrocarbons and many other toxic compounds into components that can easily be taken up by other microorganisms and plants as a nutrient source or can be safely returned to the environment. Those degraded organic components are converted into water, CO2 and other inorganic compounds. To help the microorganisms to grow and degrade the pollutants at a rapid rate, environmental parameters should be optimum [2]. However, certain limitations are reported in this technology. Chlorinated hydrocarbons or other high aromatic hydrocarbons are almost resistant to microbial degradation or degraded at a slow pace [3]. Most of the techniques in bioremediation are aerobic in nature, but anaerobic processes also used to help degrade pollutants in oxygen deficit areas [4].