ONLY NEWS PAPER PUBLISHED IN INDIA FOR SCIENTIFIC COMMUNITIES

NESA NEWSLETTER

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY

Vol. 27 Issue-05 (MONTHLY) May 2024

From the Editor's

Dear Readers,

In the May issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Your suggestions are always welcome for improvement.

Dr. R. S. Tomar
Editor-in-Chief
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A PANOROMIC EXPLORATION OF BIODIVERSITY

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India is one of the world's 17 megadiverse countries, hosting a wide range of ecosystems, including forests, grasslands, wetlands, and coastal areas. The country is home to about 7-8% of the world's recorded species, including around 91,000 animal species and 47,000 plant species. However, India's biodiversity faces numerous threats, including habitat loss and fragmentation due to urbanization, agriculture expansion, and infrastructure development. It is importantvto jote that deforestation, primarily for timber extraction, agriculture, and urbanization, has led to the decline of many forest-dependent species and ecosystems. Pollution, particularly air and water pollution, poses significant threats to biodiversity, affecting both terrestrial and aquatic ecosystems.

Invasive species, introduced through trade and transportation, disrupt native ecosystems and outcompete indigenous species, leading to biodiversity loss. Climate change is exacerbating existing threats to biodiversity by altering ecosystems, disrupting species' habitats, and affecting their reproductive patterns and migration routes. Overexploitation of natural resources, such as overfishing, illegal wildlife trade, and poaching, threatens numerous species with extinction. Despite these challenges, India has implemented various conservation initiatives, including the establishment of protected areas, wildlife sanctuaries, and national parks to safeguard critical habitats and species. Additionally, community-based conservation efforts, sustainable development practices, and environmental education programs are being promoted to engage local communities in biodiversity conservation and sustainable resource management.

Biodiversity is crucial for the health and resilience of

ecosystems. It provides a wide range of ecosystem services, including:

Ecological Stability: Diverse ecosystems are more resilient to disturbances such as disease outbreaks, invasive species, and climate change.

Economic Benefits: Biodiversity supports industries such as agriculture, forestry, and fisheries, providing food, medicine, and raw materials.

Genetic Resources: Biodiversity preserves the genetic diversity of species, which is essential for breeding programs, medical research, and adaptation to changing environmental conditions.

Ecosystem Services: Biodiverse ecosystems provide services like pollination, water purification, flood control, and carbon sequestration, which are vital for human well-being.

Cultural Significance: Biodiversity enriches cultures and societies through spiritual, aesthetic, and recreational values, contributing to our sense of identity and heritage.

Biodiversity is fundamental for the functioning of ecosystems, the economy, human health, and cultural well-being. Protecting and conserving biodiversity is essential for sustainable development and the long-term survival of life on Earth.

Factors responsible for the decline of biodiversity

Several factors contribute to the decline of biodiversity:

Habitat Loss and Fragmentation: The conversion of natural habitats into agricultural land, urban areas, and infrastructure projects destroys ecosystems and fragments remaining habitats, leading to loss of biodiversity.

Pollution: Pollution from sources such as industrial waste, agricultural runoff, and plastic waste contaminates ecosystems, harming both aquatic and terrestrial species.

Climate Change: Rising temperatures, altered precipitation patterns, and extreme weather events disrupt ecosystems and threaten the survival of many species, particularly those with specific habitat requirements.

Overexploitation: Unsustainable harvesting of wildlife for food, medicine, pets, and ornamental purposes, as well as overfishing and illegal logging, deplete populations and drive species to extinction.

Invasive Species: Non-native species introduced to new environments can outcompete native species for resources, prey on them, or introduce diseases, leading to declines in native biodiversity.

Habitat Degradation: Activities such as deforestation, land degradation, and soil erosion degrade habitats, reducing their suitability for native species and contributing to biodiversity loss.
Fragmented Policies and Governance: Inadequate policies, weak enforcement of regulations, and conflicts between conservation and development goals often fail to address the root causes of biodiversity decline effectively.

Addressing these factors requires coordinated efforts at local, national, and international levels to protect and restore habitats, mitigate climate change, regulate pollution, promote sustainable resource management, control invasive species, and strengthen governance frameworks for biodiversity conservation.

Strategies can you use to protect biodiversity?

Protecting biodiversity involves a range of strategies, including:

Conservation of habitats: Preserving natural areas such as forests, wetlands, and coral reefs helps maintain biodiversity.

Sustainable land use: Implementing practices that minimize habitat destruction and fragmentation, such as sustainable agriculture and forestry.

Species protection: Establishing protected areas, enforcing wildlife laws, and implementing breeding programs for endangered species.

Combatting invasive species: Controlling the spread of invasive species that threaten native biodiversity.

Sustainable resource management: Managing fisheries, forests, and other resources in a way that balances human needs with biodiversity conservation.
Education and awareness: Increasing public understanding of the importance of biodiversity and encouraging conservation efforts.

International cooperation: Collaborating across borders to address global threats to biodiversity, such as climate change and illegal wildlife trade.

PHOTO CREDIT: *Saikat Kumar Basu*

MICROPLASTICS POLLUTION IN SOIL-PLANT SYSTEM AND POTENTIAL REMEDIATION METHODS

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Plastic is a common material required in many aspects of our daily life. According to Barcelo et al., (2020), 1 million plastic bottles are used every minute and annually 4 trillion plastic bags are used. Plastics are released in the environment as a result of unauthorized dumping and poor waste management. These materials have an extended lifespan in the environment and they can readily gather in different ecosystems (Li et al., 2016).

Tiny plastic particles of less than 5 mm diameter are known as microplastics which originate from a variety of sources as a result of the breakdown of larger plastic debris. Due to their small size, they spread easily in the environment and contaminate, soil, air and water bodies.

The issue of microplastic pollution is spreading rapidly around the globe and is currently the second most emerging environmental problem (He 2018; Mai 2018). It poses a threat to marine and terrestrial ecosystems, leading to potential health hazards in organisms including human beings.

Microplastics can also affect plant growth in the terrestrial environment. Several studies have demonstrated that plastics and microplastics in soils may have a detrimental impact on soil micro-organisms which in turn affect soil properties and growth of plants (Jia, et al., 2023; Rilling 2017; Qi 2020).

Microplastic and plants:
Microplastics change soil properties and interferes with plant growth. They can change soil structure, affect water retention and soil aeration. Such changes influence root development in plants thereby affecting plant nutrient uptake. Besides this, microplastics can contain toxic pollutants which may be absorbed by plants, thereby entering the food chain. Studies have shown that the presence of microplastics can lead to reduced seed germination and stunted growth in some plant species, ultimately affecting agricultural productivity. Table 1 gives the list of direct and indirect effects of microplastics in soil-plant system

Table 1: Direct and indirect effects of microplastics in soil-plant system.

Direct effect	Indirect effect
Decreased seed germination	Disrupted soil microbial communities
Reduced adventitious root development	Reduced soil fertility
Reduced leaf growth, biomass and yield	Altered nutrient uptake
Altered soil structure	Transport of pollutants from soil to plant system

Remediation methods
Physical, chemical, as well as biological remediation methods can be adopted to reduce the harmful effect of microplastic pollution in plants. Each with has its own advantages and limitations.

1. **Physical Remediation Methods**
   - **Soil washing:** removal of microplastics from soil by flushing the soil with water.
   - **Magnetic Separation:** Use magnetic materials like iron oxides coated with substances that can bind to microplastics.
   - **Sieving:** passing the soil through a series of different sized screens.
   - **Ultrasonic Agitation:** uses high-frequency sound waves to dislodge microplastics from soil.

2. **Chemical Remediation Methods**
   - **Oxidative degradation:** Oxidizing agents like hydrogen peroxide (H2O2) is applied to soil to oxidize organic matter, leaving microplastics behind.
   - **Acid Digestion:** Strong acids, like sulfuric acid or hydrochloric acid are used to dissolve soil organic matter leaving microplastics behind.
   - **Chemical Flocculation:** Chemicals are used to aggregate microplastics into larger particles for easy removal.

3. **Biological Remediation Methods**
    - **Phytoremediation:** Use of plants to absorb,\ accumulate, or degrade microplastics.
    - **Microbial Degradation:** Utilizing bacteria and fungi which can degrade microplastics.
    - **Rhizoremediation:** symbiotic relationships between plant roots and microorganisms enhance degradation.

Table 2: Advantages and limitations of different remediation techniques.

Remediation methods	Advantages	Limitations
Soil washing:	Effective for large-scale removal; may be integrated with other methods like as filtering.	High water usage; requires disposal of contaminated wash water.
Magnetic Separation:	Quick and efficient method and does not cause extensive soil disturbance,	Not cost effective for large scale application.
Sieving	Simple and easy and inexpensive method with no chemical use.	Less effective for microplastics smaller than the mesh size of the sieve. Labour intensive.
Ultrasonic Agitation	Non-destructive and efficient method	Requires careful tuning of ultrasonic frequency and effectiveness can vary with soil types.
Oxidative degradation:	Highly effective and thorough removal of microplastics. Can be applied to wide range of soil type.	Oxidizing agents can be alter soil properties, affect soil organisms and can harm non-target organisms
Acid Digestion	High efficiency	Can be hazardous, requires careful handling and disposal procedures.
Chemical Flocculation	Simple and cost-effective method that can be applied to various soil types	Potential environmental impact of introduced chemical flocculants.
Phytoremediation	Environment friendly and can improve soil health.	Limited by the capacity of plant species to uptake/degrade microplastics.
Microbial Degradation	Sustainable method & effective for breakdown of certain microplastics.	Requires identification of suitable microorganisms and degradation rates may vary.
Rhizoremediation	Synergistic approach which helps in microplastic removal.	Complexity of rhizosphere interactions, affect the effectiveness of microplastic degradation.

CONCLUSION

Microplastic pollution affects plant growth and development having both direct and indirect effects on soil-plant system. Management of microplastic pollution involves a multidisciplinary approach involving physical, chemical, and biological remediation methods. Further research and technological advancements are needed to enhance the effectiveness and feasibility of different remediation techniques.

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THE TWO FACES OF RIPENING: CLIMACTERIC AND NON-CLIMACTERIC FRUIT PHYSIOLOGY

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Abstract

Fruit ripening is a complex and highly coordinated developmental process involving numerous physiological, structural, and metabolic changes. This process is regulated by the expression of many ripening-related genes under the control of a network of signalling pathways. Fleshy fruits are classified as either climacteric or non-climacteric. Climacteric fruits share a common ripening mechanism regulated by ethylene, whereas the ripening mechanism in non-climacteric fruits remains controversial. This article summarizes the hormonal regulation of both climacteric and non-climacteric fruit ripening. Therefore understanding the physiological profiles of perishable fruits can serve as a powerful tool for their optimized commercial utilization.

Introduction

Postharvest physiology, shelf-life, and fruit decay are interconnected processes primarily governed by the final phase of fruit maturation known as ripening. This phase involves various physiological, biochemical, and developmental changes that occur in a coordinated and genetically regulated manner. Fruits generally exhibit two distinct respiratory patterns during ripening, categorizing them into climacteric and non-climacteric groups. The term 'climacteric' was originally proposed to describe the significant increase in respiration (rise in CO_2 production) that occurs during fruit ripening. Climacteric fruits include apple, mango, papaya, tomato, cherimoya, banana, pear, apricot, peach, plum, avocado, plantain, fig, guava, jackfruit, muskmelon, nectarine, passion fruit, and others. Non-climacteric fruits include citrus fruits (orange, grapefruit, lemon, lime, etc.), berries (cranberry, raspberry, strawberry, cherry, blackberry, etc.), grape, pineapple, lychee, melon, loquat, pomegranate, and more. Both climacteric and non-climacteric fruits undergo significant changes during their development from ovary to mature fruit, including modifications in color, texture, and the balance of sugars and acids. Non-climacteric behavior in fruits is characterized by a negative ethylene feedback mechanism, where ethylene does not promote its own production, leading to a steady, low level of ethylene and a slower ripening process. Climacteric fruits undergo a burst of respiration and ethylene production at the onset of ripening due to a positive feedback mechanism where ethylene stimulates its own synthesis, leading to rapid ripening. This self-amplifying ethylene production is accompanied by a significant increase in respiration rate, known as the climacteric rise. Ethylene concentrations below 1 $\mu L\ L^{-1}$ are sufficient to saturate ethylene receptors. However, the rate of ethylene production varies among species and cultivars of climacteric fruits, governing their ripening behaviour.

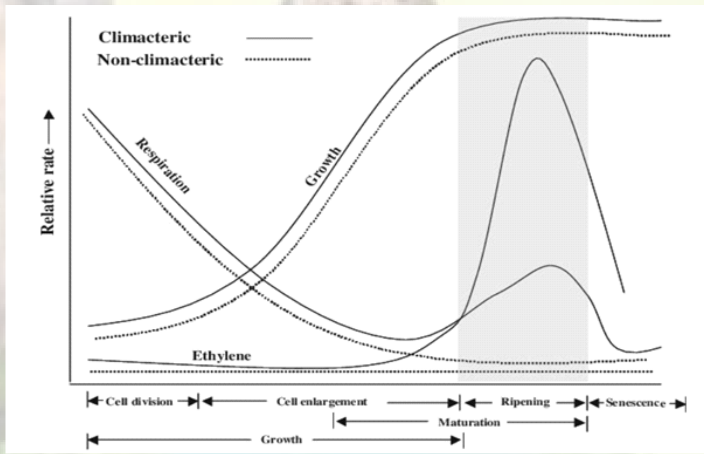

Fig. 1: Respiration and ethylene production leads to alteration in fruits (Paul *et al.*, 2012)

Climacteric fruits exhibit higher endogenous ethylene levels compared to non-climacteric fruits (Table 1). Ethylene sensitivity and receptor numbers increase rapidly after ripening begins in climacteric fruits. Climacteric fruits can ripen fully if harvested at the end of their growth period, while non-climacteric fruits only ripen fully if attached to the parent plant. Detached non-climacteric fruits at full growth stage will not ripen or will ripen slowly and do not respond to external ethylene, except for chlorophyll degradation in certain fruits like citrus and pineapples. Cyanide-insensitive respiration is minimal in non-climacteric fruits, and their respiratory and ethylene surge is either absent or brief, even with ethylene application.

Table 1: Range of ethylene in different fruits during ripening (Paul *et al.*, 2012).

Climacteric fruit	µL L-1	Non-climacteric fruit	µL L-1
Apple	25–2500	Lemon	0.1–0.2
Pear	70–80	Lime	0.3–2.0
Peach	1–21	Orange	0.1–0.3
Avocado	29–74	Pineapple	0.2–0.4
Mango	0.05–3.0	Strawberry	0.03–0.36
Passion fruit	466–530	Grapes	<0.5
Plum	0.2–0.3	Black berry, blue berry, crane berry	0.1 - 1

Hormonal regulation of climacteric ripening

Ethylene is a crucial plant growth regulator in climacteric fruit ripening. Ethylene biosynthesis in fruit ripening involves the conversion of methionine to *ACC (1-aminocyclopropane-1-carboxylic acid*) via SAM (S-adenosylmethionine) and ACS (*ACC synthase*), with ACC being converted to ethylene by *ACO* (*ACC oxidase*). Ethylene production is regulated by two systems: system-1 (auto inhibitory) in unripe fruits and vegetative tissues, and system-2 (autocatalytic) in floral senescence and fruit ripening. Various genes, including different isoforms of *ACS* and *ACO*, show differential expression during these processes. In tomatoes, five different isoforms of *ACC oxidase* (*ACO*) are involved in fruit development and ripening, with *ACO1* and ACO_4 showing moderate expression in system-1, while ACO_3 is expressed transiently during the transition phase (Barry *et al.*, 1996; Nakatsuka *et al.*, 1998). There are nine *ACC synthase* (*ACS*) genes in tomatoes, with five being expressed during ripening. In system-1, *ACS1A* and *ACS3* are expressed at low levels, and *ACS6* shows higher expression. *ACS2* and *ACS4* play crucial roles in the transition from system-1 to system-2. In plums, there are four members of the *ACC synthase* gene family (*PsACS*), which are differentially regulated. System-1 ethylene synthesis continues throughout plum fruit development until physiological maturity, at which point the transition to system-2 occurs. This transition is influenced by auxin, gibberellin, and other ethylene-independent factors. Therefore, ethylene-dependent and ethylene-independent pathways coordinate the ripening process in climacteric fruits (El-Sharkawy*et al.*, 2008).

Ethylene perception and signal transduction in plants are mediated by ethylene receptors (ETRs), which belong to a multigene family. In tomatoes, there are seven ETR family members (LeETR1–7), with LeETR3 linked to the NR mutation. LeETR4–6 are highly expressed in reproductive tissues and less in vegetative tissues. Downregulation of LeETR4 leads to early fruit ripening without affecting fruit size, yield, or flavor. LeETR4, LeETR6, and NR are expressed during fruit ripening. ETRs are membrane proteins located in the endoplasmic reticulum and act as negative regulators of the ethylene response pathway. Ethylene receptors negatively regulate the ethylene response through the action of the *Constitutive Triple Response1* (CTR1) gene, which acts downstream of *ETR*. *CTR1* encodes a Raf-like Ser/Thr kinase that interacts with ETR. In tomatoes, four CTR homologues (*SlCTR1–4*) have been identified, with SlCTR1 being the most actively expressed during fruit ripening. *ETHYLENE INSENSITIVE2* (*EIN2*) transduces the ethylene response to downstream transcription factors like *ETHYLENE INSENSITIVE3* (*EIN3*). *EIN3* and *EIN3*-like proteins (*EILs)* are DNA-binding proteins that bind to ethylene response elements (*EREs*) and regulate ethylene-sensitive genes. Ethylene response factors (*ERFs*), such as *ERF1*, act downstream of *EIN3* and activate various ethylene-response genes by binding to a conserved motif (GCC-box) in their promoter regions. The ethylene response, mediated by *EIN2*, *EIN3*, and other *EILs*, can also activate an ethylene-regulated MAP kinase cascade.

Hormonal regulation of non- climacteric ripening

It is often said that ABA is the key regulator in non-climacteric ripening. However, many studies have revealed the role of several other hormones, such as auxin, gibberellin, jasmonic acid, brassinosteroids, and even ethylene, in non-climacteric ripening. Strawberries (including both the cultivated octoploid species (*Fragaria × ananassa*) and the diploid woodland strawberry (*F. vesca*) and grapes (*Vitis vinifera*) have been the primary experimental systems for studying non-climacteric fruit ripening, despite their completely different fruit structures. Grapes develop ovary-derived berries composed of seeds and three main tissues: the skin or exocarp, the pulp or mesocarp, and the endocarp (Hardie, 1996). In contrast, the strawberry is an aggregate fruit (achenetum), where the fleshy part originates from the enlarged floral receptacle. This receptacle connects to the actual fruits, called achenes, which are situated on its surface. In strawberries, auxins are primarily synthesized within the achenes and are crucial during the early stages of development. Classic experiments with *F.* × *ananassa* demonstrated that removing the achenes hindered receptacle development, which could be restored by applying the synthetic auxin naphthoxy-3-acetic acid (NOA) (Nitsch, 1950). Given *et al.* (1988) conducted a seminal study demonstrating that the removal of achenes from the receptacle induced ripening in strawberry fruit. This study suggested that a decrease in the level of the phytohormone auxin (IAA), synthesized in achenes, could serve as a signal controlling strawberry fruit ripening. Over-expressing *FaAux/IAA*, a transcription factor in the IAA signaling pathway, as well as over-expressing *FaARF*, an IAA response factor, delayed the onset of strawberry ripening. Similarly, studies on grape berries showed that the application of IAA or NAA (a synthetic auxin) delayed ripening. Moreover, applying NAA to pre-veraison grape berries resulted in significant changes in the expression of numerous ripening-associated genes (Dal Santo *et al.,* 2020). In grapes, studies have shown that applying exogenous ABA induces the accumulation of anthocyanins, flavonols, resveratrol, and other ripening-related compounds. Molecular studies demonstrated that over-expressing *VvABF2*, an ABA-responsive transcription factor, in grapevine cell suspensions led to the accumulation of some ripening-associated compounds. In strawberries, ABA levels progressively increase during ripening, peaking at full maturity. Besides IAA and ABA, jasmonic acid (JA) also appears to play a significant role in non-climacteric fruit ripening. In grape berries, the application of MeJA (methyl jasmonate) promoted the accumulation of various ripening-associated compounds such as phenolics, anthocyanins, volatile compounds, and resveratrol. Similarly, in strawberries, MeJA application increased anthocyanin levels and aroma-related compounds.

Figure 2 demonstrates the hormonal regulation of strawberry fruit ripening, revealing a dynamic interplay between various hormones. Initially, indole-3-acetic acid (IAA) is synthesized in the achenes and transported to the receptacle, where it promotes receptacle growth while simultaneously suppressing fruit ripening. However, as fruit development progresses, abscisic acid (ABA) begins to accumulate both in the achenes and the receptacle. In the achenes, ABA acts to inhibit IAA biosynthesis and transport to the receptacle, resulting in a reduction of IAA levels in the receptacle and the alleviation of ripening suppression. Meanwhile, ABA accumulation in the receptacle serves to initiate ripening-associated processes. Additionally, it is likely that jasmonic acid (JA) accumulation may also play a role in regulating ripening-associated events at a later stage of ripening.

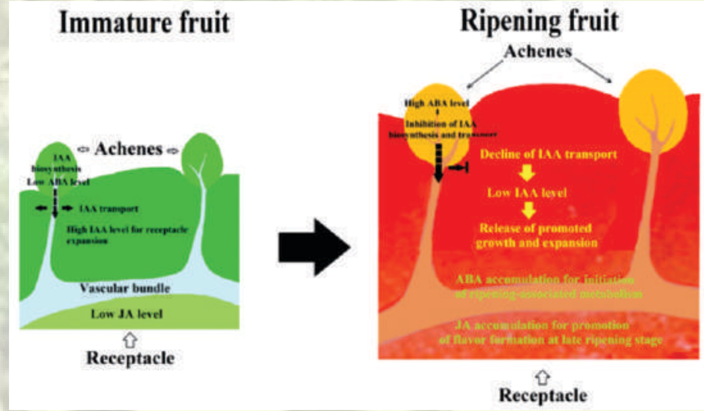

Fig. 2 : Hormonal regulation in unripe and ripe fruit of strawberry (Fan *et al.*, 2022).

Thus, the ripening of strawberry fruit is intricately regulated by the coordinated action of multiple hormones. Therefore, strawberry ripening involves complex hormonal communication between achenes and the receptacle. Since not all non-climacteric fruits have this structure, it is unclear if the strawberry ripening mechanism applies to all non-climacteric fruits.

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IMPORTANT DAYS AND DATES IN MAY 2024

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1 May: International Labour Day or May Day

Labour Day or May Day are other names for International Labour Day. It is observed on May 1st all across the world. Labour Day is known as Antarrashtriya Shramik Diwas or Kamgar Din in India.

2 May- World Tuna Day

The United Nations (UN) established it, which is marked on May 2, to increase public awareness of the value of tuna fish.

2 May - World Asthma Day (First Tuesday of May)

Every year on the first Tuesday in May, the world celebrates World Asthma Day to raise awareness of and concern about asthma. The Global Initiative for Asthma hosts a yearly occasion. The symptoms of asthma include chest tightness, dyspnea, coughing, and chronic bronchitis inflammation.

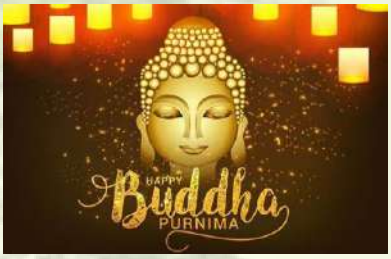
3 May - Press Freedom Day

Press Freedom Day, also known as World Press Freedom Day, is held annually on May 3 to assess press freedom throughout the world and to remember journalists who have died while performing their jobs.

4 May – Coal Miners Day

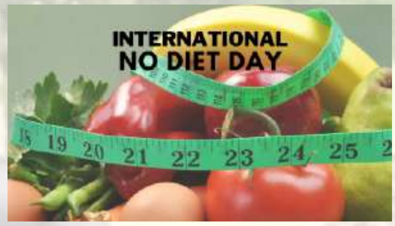
Coal Miners Day is celebrated annually on May 4 to thank coal miners. Let us inform you that coal is extracted from the ground through the process of mining. One of the riskiest jobs in India is coal mining.

5 May - Buddha Jayanti or Buddha Purnima



Gautama Buddha is thought to have been born in Lumbini, not far from Kapilavastu, on the full moon of the month of Vaishakh. 'Jyoti Punj of Asia' or 'Light of Asia' are other names for him. Buddha Jayanti or Buddha Purnima is observed on May 5th of this year.

6 May - International No Diet Day



Every year on May 6, it is celebrated. It is a celebration of accepting one's body, especially one's fatness and the variety of body types.

7 May - World Athletics Day

On May 7, World Athletics Day is held to promote athletics as the main sport and to increase youth participation in sports. introducing young people and new potential to the athletics industry.

8 May - World Laughter Day (first Sunday of May)

Every year on the first Sunday of May, World Laughter Day is observed. The initial event was held in Mumbai, India, in 1998. Dr. Madan Kataria, the man behind the global Laughter Yoga movement, organised it.

8 May - World Red Cross Day

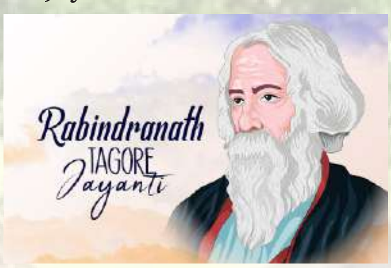
Every year on May 8th, World Red Cross Day is commemorated to mark the birth anniversary of the Red Cross's founder. Let us inform you that Henry Dunant was both the Red Cross and the International Committee of the Red Cross (ICRC) founder.

8 May - World Thalassaemia Day

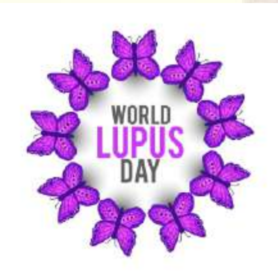
Every year on May 8, World Thalassaemia Day or International Thalassaemia Day is commemorated in remembrance of all thalassaemia patients and their parents, who have never lost hope for life despite the burden of their illness. Additionally, those who struggle to manage the disease are inspired by this day.

9 May – Rabindranath Tagore Jayanti

The day of Boishakh 25th presently falls on either the 8th or 9th of May according to the drikpanchang. He was a leading figure in Indian art, literature, Bengali poetry, humanism, philosophy, etc. He received the Nobel Prize in Literature in 1913.



10 May- World Lupus Day



On May 10, people all across the world mark World Lupus Day. Its goal was to raise our awareness of the fact that the symptoms, which at first glance might seem unrelated, are actually warning signs of a debilitating, chronic autoimmune disease.

11 May - National Technology Day

Every year on May 11, National Technology Day is commemorated to draw attention to the crucial role that science plays in our daily lives and to inspire youngsters to consider a career in the field. The Pokhran nuclear test took place on May 11, 1998, Shakti.

12 May - International Nurses Day

The anniversary of Florence Nightingale's birth is commemorated each year on May 12 by observing International Nurses Day. This day also honours the contributions that nurses have made to society worldwide.

14 May - Mother's Day (Second Sunday of May)

Every year on the second Sunday in May, Mother's Day is marked in various ways all around the world to honour mothers. Anna Jarvis, who proposed the idea of observing Mother's Day in 1907 to praise women and motherhood, is credited with creating the holiday.

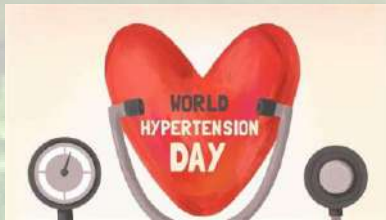
15 May – International Day of Families

Every year on May 15, the world celebrates families. The primary societal unit is the family. This day offers a chance to deepen understanding of the difficulties affecting families and the social, economic, and demographic dynamics that have an impact on them.

17 May – World Telecommunication Day

Every year on May 17, the world observes World Telecommunication Day. On May 17, 1865, the first International Telegraph Convention was signed in Paris, thus establishing the ITU. It is also referred to as International Society Day and World Telecommunication Day. It has been observed annually since 1969.

17 May - World Hypertension Day



The World Hypertension League (WHL) observes this day on May 17 each year. The goal of the day is to increase public awareness of hypertension and to motivate people to stop and manage this pandemic that kills silently.

18 May – World AIDS Vaccine Day

Every year on May 18, there is a celebration known as World AIDS Vaccine Day or HIV Vaccine Awareness Day. On this day, thousands of academics, scientists, and medical experts commemorate their contributions to the hunt for safe and effective AIDS medications.

18 May - International Museum Day

Every year on May 18, International Museum Day is

commemorated to increase public awareness of museums and their value to society. International Museum Day was established in 1977 by the International Council of Museums (ICOM). Every year, the association proposed a suitable theme, such as globalisation, overcoming cultural divides, or environmental protection.

19 May - National Endangered Species Day (Third Friday in May)

National Endangered Species Da the third Friday in May to increas value of conservation and re threatened species.

19 May- Shani Jayanti

During the festival of Shani Jayanti, also known as Shri Shanaishcar Janma Diwas, it is believed that Lord Shani (Saturn) commemorates his birth anniversary.

22 May - International Day for Biological Diversity

Every year on May 22 to raise public awareness and knowledge of biodiversity challenges, the International Day for Biological Diversity

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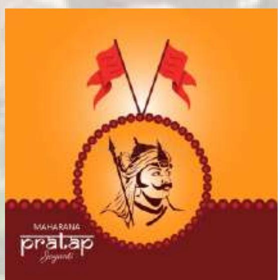
22 May- Maharana Pratap Jayanti

Maharana Pratap Jayanti commemorates the first birthday of the legendary and brave rule of Chittor. He was a renowned warrior, Rajasthan's pride, and a force to be dreaded. He was the son of Rana Udai Singh II, the ruler of Mewar.



May 23 - World Turtle Day

Every year on May 23, it is observed to raise awareness about the need to safeguard turtles and tortoises as well as their rapidly diminishing habitats. The future seems brighter with the possibility of harmonious coexistence between people and turtles.

29 May - National Memorial Day (last Monday of May)

The final Monday in May is designated as National Memorial Day. It will be celebrated this year on May 29, 2023.

30 May- Ganga Dusshera

Hindus celebrate Ganga Dussehra, commonly referred to as Gangavataran, on the Dashami of the waxing moon of the Hindu calendar month Jyeshtha. Hindus think that on this day, the sacred Ganges River came to earth from heaven.

31 May – Anti-Tobacco Day

Every year on May 31, people all over the world mark Anti-Tobacco Day or World No Tobacco Day to raise awareness and educate them about the detrimental effects of tobacco on health, including heart disease, cancer, tooth decay, and tooth discoloration.

Plant a Tree

to

Save The

Environment

BIOACCUMULATION AND ITS EFFECTS ON HUMAN HEALTH AND AQUATIC FAUNA

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Bioaccumulation refers to the accumulation of substances, such as pesticides, or other organic chemicals in an organism. When an organism takes in a poisonous material faster than it can be eliminated, this process is called bioaccumulation. Chronic poisoning is thus more likely when a chemical has a longer biological half-life, even when environmental concentrations of the toxin are extremely low. As energy moves through trophic levels, bioaccumulation typically happens at a rate of around 10% build-up per level. Because of bioaccumulation, chronic poisoning is a typical part of occupational environmental health. Exposure to these conditions' consistently low toxicity levels can eventually kill.

That someone is "as mad as a hatter" is an illustration of poisoning on the job. Mercury, in the form of organic species like methylmercury, is lipid soluble and can build up in the brain, leading to mercury poisoning; it was employed in the process of stiffening felt for hats. Lead in leaded petrol, known as tetra-ethyl lead compounds, and DDT are two more lipid (fat) soluble toxins. When the body uses fat for energy, the chemicals are released, causing acute poisoning. These compounds are stored in the body's fat. Because of its molecular similarity to calcium, strontium-90, a by-product of atomic bombs, is used in osteogenesis, despite the fact that its radiation might cause long-term damage. Toxins might bioaccumulate even when they occur naturally. When marine algal blooms, or "red tides," occur, they can harm local filter-feeding creatures like mussels and oysters. Coral fish, in particular, can get ciguatera poisoning from the build-up of ciguatoxin in reef algae.

In order to protect themselves from predators, certain animal species use bioaccumulation. This happens when a species eats poisonous plants or prey and then stores the poison. As an example, consider the tobacco hornworm. As it feeds on tobacco plants, it builds up a very dangerous concentration of nicotine within its body. The effects of poisoning on smaller customers can trickle up the food chain and impact larger consumers in the future. It is possible for organisms to acquire quantities of other substances that are typically not thought of as poisonous. For instance, vitamin A is highly concentrated in the livers of carnivores like polar bears because, as pure carnivores, they consume other carnivores (Seals) for food. Although indigenous Arctic residents knew better, some explorers have contracted Hypervitaminosis A after consuming bear livers.

Bioaccumulation:
To put it simply, it's when a chemical, such a pesticide or other organic chemical, builds up in an organism or its parts to the point where its concentration is higher than its environment. Such creatures can accumulate extremely high concentrations of these contaminants; for instance, oysters can absorb 700 ppm of DDT, despite the fact that it is only 0.001 ppm in seawater. Bioaccumulation describes this phenomenon. Bioaccumulation happens at the level of trophic interactions.

The rate at which pollutants are accumulated in the tissues of an organism may be influenced by the following:

- The concentration of pollution in the water
- The water temperature - if organism metabolism increases, so too may its rate of uptake.
- The age and sex of the organism.

Particular organs are responsible for absorbing and concentrating certain chemical species. While bioaccumulation can be a beneficial biological process for the organism, it also raises the dosage impact and can render any drug hazardous. In most cases, organometals that are water-soluble will be eliminated and will not bioaccumulate.

Biologically useful bioaccumulation:

- The thyroid is the primary site of iodide ion concentration since it is there that thyroid hormone is produced. Bioaccumulation build-up of potentially dangerous substances are being harmful.
- Lead ions can accumulate in bone, where they pose no threat until discharged into the bloodstream.
- Bone marrow mutations and leukaemia can be caused by the radioactivity of strontium and plutonium ions, which are concentrated in bone.
- Organoleads and other fat-soluble organometal compounds may accumulate in adipose tissue, where they remain inert until they are released into the bloodstream via fat breakdown into the central nervous system, where they can have harmful effects.

Mechanisms:
Substances that enter the body by respiration, food consumption, or epidermal contact or other means with substances are biologically sequestered throughout the accumulation phase.

The amount and level of a drug that is bioaccumulated is determined by

- the rate of uptake

- the mode of uptake
- how quickly the substance is eliminated from the organism
- transformation of the substance by metabolic processes
- the lipid (fat) content of the organism
- the hydrophobicity of the substance
- environmental factors
- other biological and physical factors

Biomagnification:
Biomagnification, also known as **bioamplification** or **biological magnification**, is the increase in concentration of a substance, such as the pesticide DDT, that occurs in a food chain as a consequence of:

- Food chain energetics
- Low (or nonexistent) rate of excretion/degradation of the substance.

Although sometimes used interchangeably with 'bioaccumulation,' an important distinction is drawn between the two, and with bioconcentration.

- **Bioaccumulation** occurs *within* a trophic level, and is the increase in concentration of a substance in an individuals' tissues due to uptake from food and sediments in an aquatic milieu.

Bioconcentration

- is defined as occurring when uptake from the water is greater than excretion (Landrum and Fisher, 1999). Thus, bioconcentration and bioaccumulation occur within an organism, and biomagnification occurs across trophic (food chain) levels.

If an organism does not have the enzymes necessary to break down lipid soluble (lipophilic) compounds, they will build up in its fatty tissues because they cannot be eliminated via urine, which is a water-based medium. Fats are transported by the food an organism eats to its own fat stores, which are an accumulation of the substance. A predator must ingest a large quantity of prey, including all of its lipophilic compounds, due to the high energy expenditure associated with moving up the food chain.

Algae absorb mercury (sometimes as methylmercury), even though the element is present in very trace amounts in saltwater. The rate of excretion is quite sluggish, despite its effective absorption (Croteau et al., 2005). There is a build-up in the adipose tissue of successive trophic levels due to bioaccumulation and biomagnification. This includes zooplankton, small nekton, larger fish, and so on. The greater concentration of mercury in these fish is passed on to whatever they eat. Predatory fish and birds like osprey and eagles have larger quantities of mercury in their tissues than what would be expected from direct exposure alone, and this process explains why. As an example, the EPA (1997) cited mercury concentrations of above 1 ppm in shark and over 0.01 ppm in herring fishes.

Current status:
There is strong evidence that DDT, DDE, PCBs, toxaphene, and the organic forms of mercury and arsenic do biomagnify in nature, according to a review of numerous studies by Suedel et al. (1994). However, the researchers also found that biomagnification is likely less common than previously believed. The large quantities of other pollutants in organism tissues can be explained by bioconcentration and bioaccumulation. Even more recently, a comparable result was found by Grey (2002). Nevertheless, Fisk et al. (2003) still found fault with this study for failing to take into account numerous important studies. Researchers are being motivated to thoroughly examine all paths due to these objections; also, cadmium (Cd) was recently added to the list of biomagnifying metals by Croteau et al. (2005). All of those research deal with water systems. Higher trophic levels in terrestrial systems must engage in significantly less direct intake, with most of it happening via the lungs. These compounds stay in the organisms and do not become diluted to safe levels because of bioaccumulation and bioconcentration. The fact that top predatory birds like peregrine falcons and bald eagles have been able to recover in North America after the DDT ban was enacted is proof that biomagnification is important.

Substances that biomagnify:
Biomagnifying chemicals can be categorised into two primary classes. They are both lipophilic and resistant to degradation. The absence of prior exposure and the subsequent evolution of appropriate detoxification and excretion mechanisms make novel organic compounds difficult for organisms to breakdown. This is due to the absence of selection pressure from these substances. To that end, we call these compounds "Persistent Organic Pollutants" (POPs). Being elements, metals cannot break down into smaller substances. Certain creatures possess processes that allow them to absorb and eliminate metals when exposed to high levels. In situations where organisms are unable to eliminate the substance quickly enough to prevent harm, problems emerge due to exposure to higher quantities than normal. The organic form is used for the transfer of these metals.

Novel organic substances (Monomethylmercury, Toxaphene, PCBs, DDT)
Inorganic substances (Mercury, Arsenic, Cadmium)

International POPs Elimination Network:
More than 600 public interest NGOs from around the world have joined forces to form the International POPs Elimination Network (IPEN), with the goal of quickly but

fairly eliminating persistent organic pollutants. One goal of this mission is to make sure that all chemicals are made and used in a way that doesn't hurt people or the environment. Another goal is to make sure that persistent organic pollutants (POPs) and similar chemicals do not harm our communities, food, bodies, or the bodies of people who come after us.

Effects on Human health:
People are among the many creatures that can perish due to poor air quality. Inflammation of the throat, chest discomfort, congestion, cardiovascular disease, and respiratory illnesses are all symptoms of ozone pollution. About 14,000 people die every day as a result of water pollution. This is mostly because untreated sewage in underdeveloped nations contaminates drinking water. Rash and skin irritations are possible outcomes of oil spills. Negative health effects from exposure to noise include impaired hearing, hypertension, anxiety, and disturbed sleep. Mercury has been associated with neurological symptoms and developmental delays in children. Evidence suggests that lead and other heavy metals contribute to neurological issues. Substances that are radioactive or chemical can induce cancer and other birth abnormalities.

Effect on Ecosystem:

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- Soil can lose its fertility and become unfit for plant life. Food web organisms will be impacted.
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- Toxins can undergo biomagnification when they move up the food chain and accumulate at an exponential rate.
- The process of ocean acidification, in which the pH of the world's seas is gradually declining.
- Changing climate due to global warming

PLACING WATER POTS ON ROADSIDES DURING SUMMER: A SOCIAL RESPONSIBILITY INITIATIVES

Pankaj Lavania, Garima Gupta, Sudhir Yadav, Lokesh Saini, Anshuman Shahu , Anaya Chaubey, Divyansh Srivastava, Tamin Paleng, Nipan, Bishal, Anil Kumar, Manmohan Dobriyal, Manish Kumar and *Pavan Kumar
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In the sweltering heat of summer, access to clean drinking water can be a lifesaver, not just for humans but also for animals. Recognizing this, the initiative of placing water pots on roadsides has emerged as a significant act of social responsibility under the My Social Responsibility (MSR) program, RLBCAU, Jhansi. The primary objective of this initiative is to ensure the availability of clean drinking water for passersby during the harsh summer months. This initiative aims to reduce the risk of dehydration and heat-related illnesses, promoting the well-being of humans. This simple yet impactful initiative underscores the importance of community welfare and environmental stewardship. In the heat of summer, access to clean drinking water is crucial for both humans and animals. Placing water pots on roadsides serves as a significant social responsibility initiative, addressing this vital need. This article outlines the importance, implementation strategy, and benefits of such an initiative. Providing roadside water pots ensures hydration for pedestrians, cyclists, and other road users, reducing the risk of heat-related illnesses like dehydration and heatstroke. This initiative fosters community spirit and collective responsibility, encouraging people to care for one another and their environment.

Successful implementation involves selecting strategic locations with high foot traffic. Clay pots, which naturally keep water cool, should be used and maintained with lids to prevent contamination. Collaborating with university teachers and volunteers ensures regular refilling and cleaning of the pots. Awareness campaigns via social

networks can inform the public about the initiative, while a monitoring system helps maintain effectiveness. The primary benefit is the promotion of health and well-being by providing easy access to drinking water. This initiative also enhances environmental sustainability and animal welfare. Socially, it strengthens community bonds and encourages a culture of caring and civic responsibility.

Challenges include vandalism, maintenance, and funding. High-visibility locations and CCTV can reduce vandalism. Engaging volunteers can help with maintenance and funding through donations and contribution. Placing water pots on roadsides during summer is a powerful act of social responsibility. It addresses critical needs, promotes community welfare, and fosters a culture of kindness. Starting with a pilot program, actively involving the community, and regularly assessing the initiative will ensure its success and sustainability. This simple yet impactful initiative can significantly improve community and environmental well-being during the hottest months of the year. Promotes Health and reduces the risk of dehydration and other heat-related illnesses for people, environmental impact is that it encourages the community to be more mindful of environmental sustainability and animal welfare. Social Cohesion, builds a stronger community spirit as people come together to support a common cause. Civic Responsibility: Enhances the sense of civic duty and encourages other acts of kindness and responsibility. By adopting and promoting this initiative, we can create a more humane and supportive community environment, particularly during the challenging summer months.

In conclusion, placing water pots on roadsides during summer is a commendable social responsibility initiative under MSR. It highlights the intersection of community welfare, environmental sustainability, and traditional craftsmanship, making it a multifaceted approach to addressing seasonal challenges. Through collective effort and sustained engagement, this initiative has the potential to make a significant and lasting impact on the community.

BIOACCUMULATION AND ITS EFFECTS ON HUMAN HEALTH AND AQUATIC FAUNA

Syed Shabih Hassan
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POLLUTANT REMOVAL BY THE PROCESS OF BIOREMEDIATION

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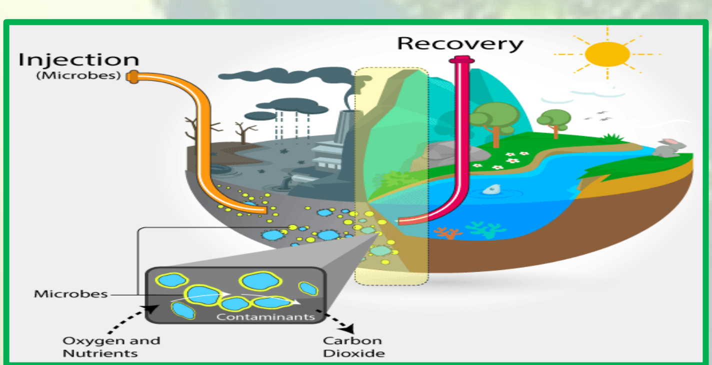
Ecosystem restoration helps degraded, damaged, or destroyed ecosystems recover. Any method that restores a polluted natural area to its pre-contamination state by means of microbes, fungus, green plants, or the enzymes produced by these organisms is known as bioremediation. Some soil contaminants can be targeted using bioremediation techniques, such as the bacterial breakdown of chlorinated hydrocarbons. Oil spill cleanup using nitrate and sulphate fertilizers to aid crude oil breakdown by native or foreign microbes is an example of a more holistic method.



Contamination can be abated or cleaned up through bioremediation, a biotechnical technique. It is a method for managing waste that makes use of living things to either eliminate or make use of contaminants in a contaminated environment. Several methods exist for cleaning polluted water or solids, including chemical treatment, burning, and landfill burial. Additional approaches to waste management exist, such as solid waste management and nuclear waste management, among others. The use of non-toxic chemicals distinguishes bioremediation from other methods. To carry out bioremediation, microorganisms such as bacteria and fungi play a key role. The most important microbes in this process are bacteria, which convert garbage into useful nutrients and chemical compounds. Bioremediation is an effective method of waste treatment, although it is not foolproof. Microbes are able to break down chlorinated pesticides and clean oil spills, but heavy metals such as lead and cadmium are indigestible to bacteria.

Overview with potential uses:
Phytoremediation and naturally occurring bioremediation have a long history of application. For instance, phytoextraction has a long history of use in desalinating agricultural land. It is said that George M. Robinson invented the technology of bioremediation, which uses microorganisms.

There are two main categories of bioremediation technologies: In-situ and Ex-situ.

Bioremediation can be either Iin-situ," meaning treated directly at the site, or "Ex-situ," meaning removed from the site and treated elsewhere.

Bioremediation technologies include landfarming, bioventing, bioaugmentation, composting, bioreactor, rhizofiltration, and biostimulation, among others. But bioremediation with microbes is not always the best option for removing toxins. For instance, creatures have a hard time absorbing or capturing heavy elements like lead and cadmium. The situation can get worse if heavy metals like mercury are assimilated into the food chain. Here, phytoremediation comes in handy, since either native plants or transgenic plants can take up these pollutants in their aerial portions, which can then be collected for disposal. Burning or recycling the collected biomass can further concentrate the heavy metals in it for use in industry.

Accelerating the development of bioremediation technologies and biotransformation processes is crucial for the elimination of various pollutants and wastes from the environment. This can be achieved by improving our understanding of the relative importance of various pathways and regulatory networks to carbon flux in specific environments and for specific compounds.

Strategies based on genetic engineering:
One promising area of genetic engineering is the development of organisms with bioremediation capabilities. Highly radioactive nuclear waste contains toluene and ionic mercury, which can be consumed and digested by the most radioresistant organism known as, the bacterium *Deinococcus radiodurans*.

Methods of mycoremediation
The use of fungus to remediate a polluted environment (often soil) is known as bioremediation, and this method is one kind of bioremediation. Paul Stamets first used the word "mycoremediation" to describe the bioremediation process that involves the utilization of fungus mycelia.

The mycelium plays a key part in decomposition, which is an important ecological function of fungi. Plant fibres are made up of lignin and cellulose, which are broken down by extracellular acids and enzymes secreted by the mycelium. They share structural similarities with numerous organic contaminants and are organic molecules made up of lengthy carbon and hydrogen chains. Finding the appropriate fungus species to attack a certain contaminant is essential in mycoremediation.

A comparable or identical method is mycofiltration, which involves filtering water in soil from harmful trash and bacteria using fungal mycelia.

Factors of bioremediation:
The optimization and control of bioremediation processes is a multi-faceted system involving numerous aspects. There must be microbes in the environment that can break down the pollutants, and those microbes must be able to access the contaminants. Other environmental parameters include things like soil type, temperature, pH, oxygen or other electron acceptors, and nutrients.

Microbial populations:
There is a vast variety of environments from which microorganisms can be extracted, making up microbial communities. Cold, heat, water, an abundance of oxygen, anaerobic conditions, dangerous substances, waste streams, and an excess of oxygen are all favourable environments for microbial adaptation and growth. Two primary ingredients are needed: energy and carbon. Microbes and other biological systems are versatile enough to break down or eliminate environmental dangers.

There are several categories into which microbes fall:
(a) Aerobic: These organisms thrive when oxygen is present. Mycobacterium, Pseudomonas, *Alcaligenes*, *Sphingomonas*, and *Rhodococcus* are some examples of aerobic bacteria known to have degradative capabilities. Hydrocarbons, including alkanes and polyaromatic chemicals, as well as insecticides, have been known to be degraded by these bacteria. A lot of these microbes get all the carbon and energy they need from the pollution.

(b) Growing without oxygen (Anaerobic): Aerobic bacteria are more common, while anaerobic bacteria are less common. Bioremediation of river sediments contaminated with polychlorinated biphenyls (PCBs), dechlorination of the solvent trichloroethylene (TCE), and chloroform are all areas where anaerobic bacteria are gaining attention. The white rot fungus *Phanaerochaete chrysosporium* is one of many ligninolytic fungi that can break down a wide variety of harmful or long-lasting environmental contaminants. Corn cobs, straw or sawdust are common substrates.

(c) Methylotrophs: Bacteria known as methylotrophs are aerobic and get their carbon and energy from methane. Methane monooxygenase, the first enzyme in the aerobic degradation process, is active against many different chemicals and has a large substrate range. Among these compounds are the chlorinated aliphatics trichloroethylene and 1,2-dichloroethane. Bacteria and pollutants must come into touch for deterioration to take place. Since the pollutants and bacteria are not evenly distributed in the soil, this is not a simple task. A chemotactic response allows some bacteria to sense contaminants and move towards them. In their path to the pollutant, some bacteria, like fungus, take on a filamentous shape. Some surfactants, including sodium dodecyl sulphate, can improve the contaminant's mobilization.

The many benefits of bioremediation include:
- The ability to eliminate pollutants entirely. There is a process that may convert many substances that are deemed dangerous into ones that are completely safe.

Because of this, there is no longer any possibility of future responsibility for the handling and disposal of polluted materials.

- It is feasible to eliminate specific pollutants entirely rather than just moving them from one environmental medium to another, as from land to water or air.
- It is generally possible to perform bioremediation on-site, and doing so usually does not necessitate extensive closure of affected areas or businesses. This also gets rid of the need to move a lot of trash to a landfill, which may be dangerous for both people and the environment.
- Bioremediation has the potential to be more cost-effective than other methods for cleaning up hazardous waste.
- When applied to regions that cannot be excavated, bioremediation offers a number of cost and efficiency related benefits. For instance, groundwater can be contaminated by hydrocarbon spills (e.g., petrol spills) or specific chlorinated solvents. By adding the right kind of electron acceptor or electron donor amendment, depending on the situation, the concentration of contaminants can be greatly reduced after some acclimation time.
- This approach is usually more cost-effective than digging up the site, disposing of it elsewhere, or using incineration or other ex-situ treatment strategies. It also lessens or eliminated.

Bioremediation monitoring:
Soil and groundwater redox potentials, pH, temperatures, oxygen content, concentrations of electron acceptors and donors, and concentrations of breakdown products (e.g. CO_2) can be used as indirect indicators of bioremediation progress.

1. To find contours of equivalent redox potential, enough points on and around the polluted site must be sampled. The majority of contouring tasks are best accomplished with dedicated software, such as Kriging interpolation.

2. It serves as a measure for overall microbial activity if all redox potential measurements reveal that electron acceptors have been utilized. To ascertain when pollutant levels and their degradation products have been brought down to levels below regulatory limits, chemical analysis is also necessary.

Conclusion:
Bioremediation decontaminates with microorganisms and bacteria. It removes impurities, pollutants, and toxins from soil, water, and other habitats. The ultimate objective of bioremediation is to eliminate noxious substances in order to enhance the quality of soil and water.

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