

CSIR NET Life Science Unit 12

Phytoremediation

We can get the Phytoremediation meaning by splitting it into two halves. 'Phyto' refers to 'plants,' and 'remediation' refers to the action of remedying something, particularly reversing or ending environmental damage. So, as the name suggests, it is the process of cleansing pollutants using natural plants.

How does Phytoremediation work?

As we know already, Phytoremediation is the process of getting rid of soil or water pollutants with the help of plants. But how does it work? Well, phytoremediation plants can remove pollutants. Using such plants with associated soil microbes reduces the concentrations or toxic effects of contaminants. Ultimately, it saturates along with the pollutants.

Here are the various pollutants that can be removed by this process.

- Inorganic contaminants
- Radionuclides
- Heavy metals like lead
- Explosives
- Volatile Organic compounds
- Oil and viscous liquids
- Pesticides

Even though there are different methods available, phytoremediation proves to be the best and cost-efficient choice. It does not cause any extra harm to the surroundings. So, it gradually became the ideal option for people.

Which are the Phytoremediation Plants?

When it comes to phytoremediation plants, we have listed a few popular and widely used varieties.

- Indian mustard (*Brassica juncea* L.)
- Poplar tree (*Populus deltoides*)
- Indian grass (*Sorghastrum nutans*)

- Hibiscus Cannabinus
- Willow (Salix species)
- Sunflower (Helianthus Annuus L.)

What are the phytoremediation types?

There are two different phytoremediation types namely microbial remediation and myco-remediation. Let us discuss both of these types in detail.

Microbial remediation

In Microbial remediation, microorganisms are employed to lower the bioavailability of pollutants (specifically organic pollutants) and make them less toxic to the environment. These microbes are able to metabolise contaminants by using them as food.

Myco-remediation

It relies on the efficient enzymes produced by mushrooms. They help in the degradation of various types of substrate and pollutants present in the soil. But sometimes they absorb the pollutant in their mycelium and cannot be ingested due to absorbed pollutants.

Phytoremediation process

Phytoremediation has definitely changed a lot due to evolving trends and technology.

Phyto sequestration

Phyto sequestration is the capacity of plants to sequester or seize certain contaminants in the root zone. Phytochemicals released in the root zone can immobilise the contaminant. This is accomplished through various plants' physiological mechanisms. It is also known as phyto-stabilization.

Phyto-stimulation

Phyto-stimulation is the degradation of pollutants in the rhizosphere (area surrounding the roots of the plants) using microbial activity increased by the presence of plant roots.

Phyto-hydraulics

Phyto-hydraulics is the ability of plants to seize, move, and transpire water from the environment and thereby contains pollutants and control the hydrology of the environment. However, this process does not degrade the contaminants. The efficiency of this process depends on the rooting depth as well as the characteristics of the plant.

Phytoextraction

In phytoextraction, plants remove harmful contaminants from soil or water, particularly heavy metals. They can eliminate high-density metals that can be toxic to organisms even at low concentrations.

Phytovolatilization

In the phytovolatilization process, plants remove dangerous pollutants from soil and release them as volatile gases in the atmosphere. This process is completely carried out by the evapotranspiration process.

Phytodegradation

Phytodegradation is the breakdown of contaminants surrounding the plant through the plant enzymes. In general, plants are capable of producing enzymes that can catalyse and accelerate degradation. Thus, pollutants are broken into simple molecular forms and are absorbed into plant tissues to support plant growth.

Advantages of Phytoremediation

Still cannot believe in the potential of plants that eliminate dangerous contaminants? Check out these advantages of phytoremediation plants.

- Completely natural and harmless process of removing pollutants.
- Cost-efficient
- Reduces the requirement of the human workforce
- Eco-friendly and sustainable
- Comparatively effective than other pollutants removing methods
- Suitable for multiple contaminants removal

Disadvantages of Phytoremediation

Every coin has two sides, likewise, phytoremediation plants do possess some backlogs.

- Even though it has some superior qualities, it takes so much time to completely remove the contaminants
- To ensure good results, good cultivation and maintenance are required for a long time
- Improper discarding of plants might lead to some serious issues

Conclusion

In the last decade, the condition of our environment was not the same as it is now. We almost lost many of the good qualities in our surroundings due to high pollution and toxin release. If we did not take any step to put a curb on this situation, it might possibly lead to dangerous situations. As of now, we can only prevent further damage to the earth by removing the already existing pollutants. In that way, phytoremediation plays a major role in helping us regain a healthy environment.



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