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Green Bioremediation Technology

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Abstract

Phytoremediation is the process of bioremediation by the help of plants that alleviate the environmental issues without the necessity to dig the contaminant substance and discard of it in the surroundings. Heavy metals like arsenic, cadmium, nickel, iron, aluminum, copper, mercury, lead, beryllium remain in soil and are unsafe to animals even in minor quantity. Therefore, plants are used to purify the soil. Each and every heavy metal has distinct effects on public health and also causes demise to human life. Through natural and human interruption (anthropogenic) causes, heavy metals come into the environment. It has been reported that there are several vegetation commonly used for heavy metal accumulation from environment. Some of the vegetation used in phytoremediation are alfalfa, sunflower, hybrid poplar trees, arrowroot, Indian mustard, yellow or white water lilies, chickpea, cucumber, lantana, canola etc.

Introduction

Toxic environment can cause risk to human health and give rise to various diseases all over the world. Heavy metals are one of the dangerous nature pollutants and are mostly found in manufacturing areas. The normal functioning of organs like liver, brain, kidney and blood can be altered and harmed by noxious heavy metals.

We cannot simply degrade heavy metals therefore it is a primary trouble for the environment as compared to other pollutions. Green bioremediation technology which is a favorable technique for eliminating toxic heavy metals from environment is used as an alternative answer to such problems.

Phytoremediation, which is a type of bioremediation approach, is justifiably used for detoxification of heavy metals, because it is a systematic, budget friendly and organic technology which depends upon the plants.

Plant Heavy Metal Uptake: Mechanism

Plants can clean up the polluted sites in different ways. Toxicity prohibiting mechanisms are generally found at the root system and therefore, the uptake of impurities is primarily done by root system of plants.

First the plant roots take up the pollutant (heavy metals) from the soil particles, and then the heavy metal will bind into the root tissue. After that the heavy metals transport into growing shoots which inhibit the heavy metals from leak out of the soil (Figure 1).

Seven mechanisms have been identified in plants which affects the toxic heavy metal mass in soil and water:

- ***Rhizosphere Degradation:*** The action of microorganisms present on rhizosphere for metal breakdown is known as

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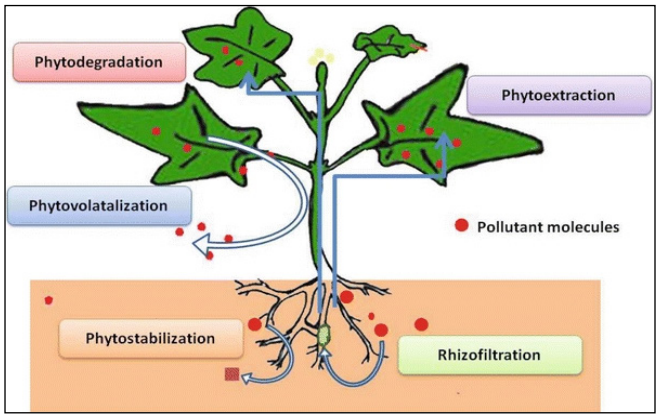

Figure 1: Heavy metal uptake mechanism of plant

rhizosphere degradation.

• ***Rhizofiltration:*** It refers to metal segregation from water by the help of roots.

• ***Phytostabilization:*** The roots of plant limit the ability of metals to move in soil. This mechanism is called as **phytostabilization**.

• ***Phytoextraction:*** It simply means metal accumulation in shoots.

• ***Phytodegradation:*** Transformation or disintegration by enzymes present in tissues refers to **phytodegradation.**

• ***Phytovolatization:*** It is the process of metal conversation into volatile structure and eventually allows leaving them through the surface of leaf into the ecosystem.

• ***Hydraulic control:*** The plant canopies checks the soil field space and the water table. This is known as **hydraulic control.**

Heavy Metal Bioaccumulators

Over 500 species of plant have the property of metal bioaccumulation out of which angiosperms comprises approximately 0.2%. Plant cellular system which is involved in eliminating poisonous heavy metals provides them forbearance to metal stress. Metal stress tolerance is a genetically inherited attribute.

In recent years, many researchers in the various corners of the world have come out with the capability of several plants as metal bioaccumulators. Some of the plant bioaccumulators have been listed in table 1.

Table 1: several plants used as bioaccumulators

SL. No.	Plant	Heavy metal uptake
1	Indian mustard (*Brassica juncea* L.)	Cd, Pb, Se, Zn, Hg, Cu
2	Sunflower (*Helianthus annus* L.)	Pb, Cu, Cd, Zn, Ni
3	Willow (*Salix species*)	Cd, Pb, Ni
4	Corn (*Zea May's* L.)	Cd, Pb, Zn, Cu
5	Alfalfa (*Medicago sativa* L.)	Cd
6	Spinach (*Spinacia oleracea* L.)	Pb, Cd, Zn, Cu, Ni, Cr
7	Pea (*Pisum sativum*)	Cu, Pb, Cd
8	Canola (*Brassica napus* L.)	Pb, Cd
9	Radish (*Rapanus sativus* L.)	Cd, Pb, Cu, As
10	Lettuce (*Lactuca sativa* L.)	Pb, Cd, Ni, Cu

Conclusion

Now from the above information we can conclude that, plant heavy metal uptake is a substitute to remediation methodology to tidy up the impurity from the ecosystem for the treatment of toxic areas. In soil metals are the usual components but in peak amount they are poisonous to microbes, flora and fauna. Phytoremediation is considered as a beneficial perspective for detoxification of toxic ecosystem and also improve bad soil quality. Plants are powerful bioaccumulators which work under seven mechanisms.

References

Sumiahadi, A., Acar, R. 2018. A review of phytoremediation technology: heavy metals uptake by plants. InIOP Conference Series: Earth and Environmental Science 2018 Mar (Vol. 142, No. 1, p. 012023).

Ranjan, A., Singh, S., Kumar, V., Majhi, M., 2020. Remediation Measures for Arsenic Pollution of Soil. Biotica Research Today. 2, 7 (Jul. 2020), 680-683.

Sarma, H., 2011. Metal hyperaccumulation in plants: a review focusing on phytoremediation technology. Journal of Environmental Science and Technology. 2011 Jan 1; 4(2), 118-38.