



## PHYTOREMEDIATION EFFECTIVE TECHNIQUE TO CONTROL POLLUTION : A REVIEW ARTICLE

**Tambe S.S**

S.P.H.Mahila College Malegaon Camp  
email -sst.sph@gmail.com

### ABSTRACT:

Environment means our surrounding i.e. everything around us that includes biotic and abiotic components with which we are always in contact. Land, surface waters, and ground water worldwide, are increasingly affected by contaminations from industrial, research experiments, military, and agricultural activities either due to ignorance, lack of vision, carelessness, or high cost of waste disposal and treatment. The rapid build-up of toxic pollutants (metals, radionuclide, and organic contaminants in soil, surface water, and ground water) not only affects natural resources, but also causes major strains on ecosystems. The Utilization of biological system to improve environmental quality through environmental biotechnology. Bioremediation as a method to solve environmental contamination, which uses living organism like microbes, plants etc. to clean up contaminated soil, air and water. Phytoremediation most effective technique used for removing hazardous substance from soil, surface or ground water contamination.

**Keywords:** Phytoremediation, contamination, pollution.

### INTRODUCTION:

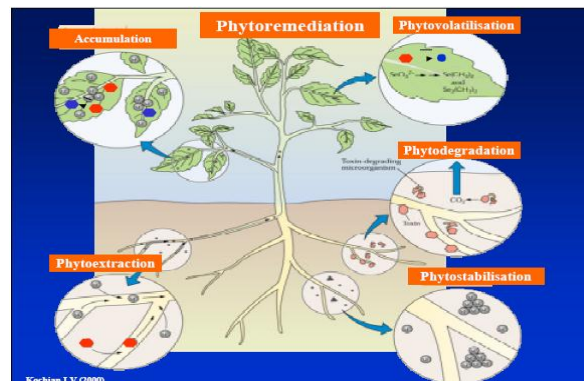
Phytoremediation is In situ use of plants to stabilize, remediate and reduce or restore contaminated soil, sediment or ground waters. Phytoremediation is described as a natural process carried out by plants and trees in the cleaning up and stabilization of contaminated soils and ground water. It is actually a generic term for several ways in which plants can be used for these purposes. It is characterized by the use of vegetative species for in situ treatment of land areas polluted by a variety of hazardous substances (1) or defined phytoremediation as an emerging cost effective, non-intrusive, aesthetically pleasing, and low cost technology using the remarkable ability of plants to metabolize various elements and compounds from the environment in their tissues (2). Phytoremediation technology is applicable to a broad range of contaminants, including metals and radionuclides, as well as organic compounds like chlorinated solvents, polychloribiphenyls, polycyclic aromatic hydrocarbons, pesticides/insecticides, explosives and surfactants. According to Macek (3), phytoremediation is the direct use of green plants to degrade, contain, or render harmless various environmental contaminants, including recalcitrant organic compounds or heavy metals. Plants are especially useful in the process of bioremediation because they prevent erosion and

leaching that can spread the toxic substances to surrounding areas (4).

### METHODS OF PHYTOREMEDIATION:

Phytoremediation of contaminated soils is generally believed to occur through one or more of the following mechanisms or processes: phyto extraction, phyto stabilization, phyto degradation, phyto volatilization, rhizo filtration and rhizo degradation (5), (6), as shown in Fig. 1 and Table I. Phytoremediation is applicable to a broad range of contaminants, including heavy metals and radionuclides, as well as organic compounds like chlorinated solvents, polycyclic aromatic hydrocarbons, pesticides/insecticides, explosives, and surfactants (5), (6).

**Photo 1.** Phytoremediation process and different methods



**Table. 1-** Phytoremediation methods and its description and plant used for techniques

Sr.no	Phytoremediation methods	Description	Plants used
1	Phytoextraction	Plants absorb contaminants and store in above-ground shoots and the harvestable parts of roots.	<i>Brassica juncea</i> , <i>Typhalatifolia</i> , <i>Azolla filiculoides</i> , (Brassicaceae, Euphorbiaceae, Asteraceae, Laminaceae plant families)
2	Phytostabilization	Roots and their exudates immobilize contaminants through adsorption, accumulation, precipitation within the root zone, and thus prevent the spreading of contaminants.	<i>Brassica juncea</i> , <i>Glycine max L.</i>
3	Phytodegradation	Plant enzymatic breakdown of organic contaminants, both internally and through secreted enzymes.	<i>Myriophyllum aquaticum</i> , <i>Salix nigra</i> , <i>Taxodium distichum</i> , <i>betula nigra</i>
4	Phytovolatilization	Plant roots stimulate soil microbial communities in plant root zones to break down contaminants	<i>Arabidopsis thaliana</i> , <i>Brassica juncea</i> , <i>Brassica napue</i>
5	Rhizofiltration	Contaminants taken up by the roots through the plants to the leaves and are volatilized through stomata where gas exchange occurs.	<i>Helianthus annuus.L</i> , <i>Hydrocotyle umbellate</i> , <i>Lemna minor</i> , <i>Azolla pinnata</i>

Phytoremediation of various inorganic pollutants such as Cd, Cr, Pb, Cu, Zn, Co, Ni, Se, Cs and as has been extensively studied. This is mainly based on the use of natural hyperaccumulator plants with exceptional metal-accumulating capacity, which can take up metals to concentrations at least an order of magnitude greater than the normal plants growing in the same environment. These plants have several beneficial characteristics such as the ability to accumulate metals in their shoots and an exceptionally high tolerance to heavy metals (6), (7). At present, there are totally more than 400 species of hyperaccumulator plants for As, Cd, Mn, Ni, Zn etc. have been found.

#### RESULTS & DISCUSSION:

Phytoremediation involves growing plants in a contaminated matrix to remove environmental contaminants by facilitating sequestration and/or degradation (detoxification) of the pollutants. Plants are unique organisms equipped with remarkable metabolic and absorption capabilities, as well as transport systems that can take up nutrients or contaminants selectively from the growth matrix, soil or water. Plants studied for phytoremediation of various metals, metalloids, non-metals, nutrients, and organic contaminants were reviewed and listed by Pivetz (7), among which Indian mustards, willow,

hybrid poplars, duckweed, corn, alfalfa, and ryegrass are very popularly use.

#### CONCLUSION:

Human population explosion and their demands completion from different industries, mills sewage waste, created different types of pollutions, and its affect directly and indirectly on human life and other organism as well as on environment .At the pollution site some plants grows naturally and acts as a bio indicators this plants also controls the pollution this method is cheaper and not harmful to ecosystem .Phytoremediation is innovative cleanup technology for sustainable development for better future for human life

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