Review On Different Plants of Phytoremediation

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Abstract: Due to Rapid growth on Urbanization, sewage water quantity is also increasing. Hence, one of the Low cost method, Phytoremediation is being introduced as a innovative green technology which treats the sewage water through plants. Together with various types of bacteria, and algae like green, red and brown (diatoms), the water weeds also have to capacity to treat the sewage. e.g. Phytoplankton are floating small plants; they form the primary basis of the animals' life in the oceanic water.

Index Terms **– Phytoremediation, Domestic sewage water, Eco-friendly technology.**

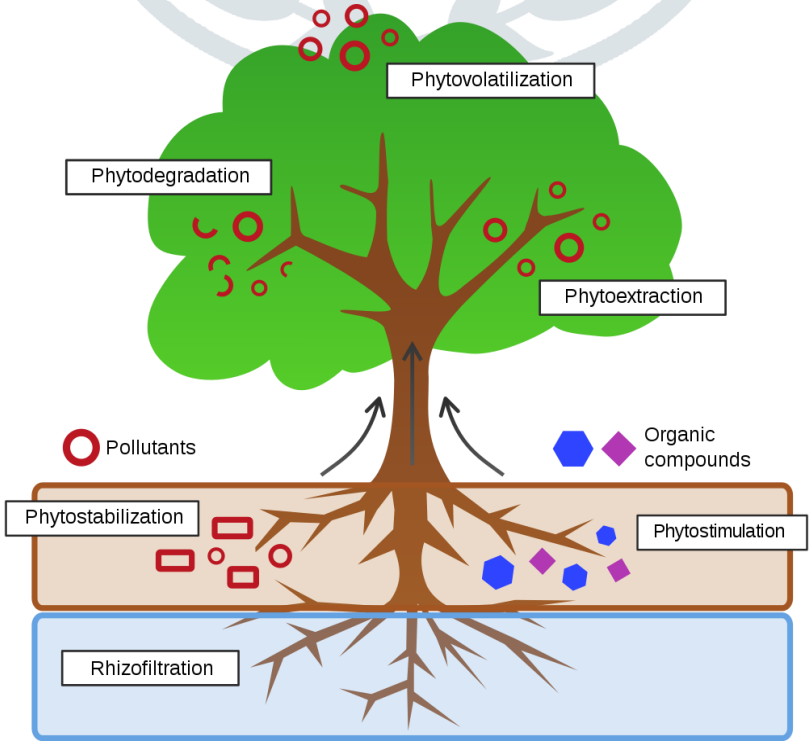
1. INTRODUCTION

Today, together with another environmental problems most of the urban & semi-urban settlements in all over the world, face the problem of waste water and solid waste disposal. These wastes are of different types like, spent water from kitchens, industrial processes, semi-liquid waste from animal & human excreta, dry refuse of houses streets and industrial waste material etc.; are the main products of waste water and solid waste. It composition and the characteristics of the sewage, depends upon, the source of the sewage. The domestic sewage is mainly consisted of the garbage, detergents from the washing of the clothes, while the industrial sewage, and depends upon the type of industry, type of raw material, type of power resource and the type of industrial processing. The public places like schools, government offices, public gardens, railways and bus stations etc. also have different types of sewage. Some of the conventional Biological treatment methods like Activated sludge process and trickling filters. These methods are very costly and there running cost is also very high and most of the treatment plant do not give 100% result due to lack of proper maintenance and due to lack of skilled worker required to run the mechanism. Hence low cost treatment units have been introduced.

2. PHYTOREMEDIATION

Phytoremediation (from Ancient Greek, meaning plant, and Latin remedies, meaning restoring balance) refers to the technologies that use living plants to clean up soil, air and water contaminated with hazardous contaminated. It is defines as "the use of green plants and the associated microorganisms, along with proper soil amendments and agronomic techniques to either contain, remove or render toxic environmental contaminants harmless". Phytoremediation is a cost effective plant based approach of remediation that takes advantage of the ability of plants to concentrate elements and compounds from the environment and to metabolize various molecules in their tissues. It refers to the natural ability of certain plants called hyper accumulators to bio accumulate, degrade or render harmless contaminants in soils, water or air. Toxic heavy metals and organic pollutants are the major targets for phytoremediation. Knowledge of the physiological and molecular mechanism of phytoremediation began to emerge in recent years together with the biological and engineering strategies designed to optimize and improve phytoremediation.

3. METHODOLOGY



A range of processes mediated by plants or algae are useful in treating environmental problems.

3.1 Phytoextraction

Phytoextraction uses plants or algae to remove contaminants from soil or water into harvestable plant biomass. The roots take up substances from the soil or water and concentrate it about ground in the plants biomass. Organisms that can uptake extremely high amounts of contaminants from the soil are called hyper accumulators. Phytoextraction can also be performed by plants that take up lower level of pollutants, but due to their high growth rate and biomass production, may remove a considerable amount of contaminants from the soil. Phytoextraction has been growing rapidly in popularity worldwide for the last twenty years or so. Typically, Phytoextraction is used for heavy metals or other inorganics. At the time of disposal, contaminants are typically concentrated in the much smaller volume of the plant matter than in the initially contaminated soil or sediment. After harvest, a lower level of the contaminant will remain in the soil, so the growth /harvest cycle must usually be repeated through several crops to achieve significant clean up. After the process, the cleaned soil can support other vegetation.

3.2 Phytostabilization

Phytostabilization reduces the mobility of substance in the environment for eg, by limiting the leaching of substance from the soil. It focuses on the long term stabilization and containment of the pollutant. The plant immobilized the pollutants by binding them to soil particles making the less available for plant or human uptake. Unlike Phytoextraction, phytostabilization focuses mainly on sequestering pollutants in soil near the roots but not in plant tissues. Pollutants becomes less bioavailable, resulting in reduced exposure. The plants can also excrete a substance that produce a chemical reaction, converting the heavy metal pollutant into a less toxic form. Stabilization results in reduced erosion, runoff, leaching, in addition to reducing the bioavailability of the contaminant.

3.3 Phytodegradation

Phytodegradation uses plants or micro-organisms to degrade organic pollutants in the soil or within the body of the plant. The organic compounds are broken down by enzymes that the plant roots secret and these molecules are then taken up by the plant and released through transpiration. This process works best with organic contaminants herbicides

3.4 Phytostimulation

Phytostimulation (or rhizodegradation) is the enhancement of soil microbial activity for the degradation of organic contaminants, typically by organisms that associate with roots. This process occurs within the rhizosphere, which is the layer of soil that surrounds the roots. Plants release carbohydrates and acids that stimulate microorganism activity which results in the biodegradation of the organic contaminants. This means that the microorganisms are able to digest and break down the toxic substances into harmless form. Phytostimulation has been shown to be effective in degrading petroleum hydrocarbons. Phytostimulation can also involve aquatic plants supporting active populations of microbial degraders, as in the stimulation of atrazine degradation by hornwort

3.5 Phytovolatiization

Phytovolatilization is the removal of substances from soil or water with release into the air, sometimes as a result of phytotransformation to more volatile and less polluting substances. In this process, contaminants are taken up by the plant and through transpiration, evaporate into the atmosphere. This is the most studied form of phytovolatilization, where volatilization occurs at the stem and leaves of the plant, however indirect phytovolatilization occurs when contaminants are volatilized from the root zone. Popular trees are one of the most successful plants for removing VOCs through this process due to its high transpiration rate.

*3.*6 Rhizofiltration

Rhizofiltration is a process that filters water through a mass of roots to remove toxic substances or excess nutrients. The pollutants remain absorbed in or adsorbed to the roots. This process is often used to clean up contaminated groundwater through planting directly in the contaminated site or through removing the contaminated water and providing it to these plants in an off-site location. In either case though, typically plants are first grown in a greenhouse under precise conditions.

4. PLANTS FOR PHYTOREMEDIATION

4.1 SUNFLOWER:

The sunflower(helianthus annuus) is an annual plant in the family asteraceae has thus been identified as one of the target species that has great potential as a Phytoextraction due the fact that it produces large amount of biomass, capable of hyper accumulating heavy metal in its harvestable parts (stems, leaves and roots) and it grows quickly. This study therefore investigated the ability of sunflower plant to phytoremediation soils of abandoned dump sites containments with heavy metal by determining the presence of pollutants in impacted soil, determining the presence of pollutants in plants tissues and determining the main plant part of pollutants accumulation.

4.2 INDIAN MUSTARD:

Brassicaceae species are rarely useful to accumulate certain metals while producing high quantities of biomass in the process. It removes three times more Cd than others, reduce 28% of Pb, upto 48% of Se, and it is effective against Zn, Hg and Cu as well. Phytoremediation of radiocesium-cotainments soil in the vicinity of Chernobyl in 80's as well.

4.3 SUGARCANE:

Heavy metal pollution is a world wide problem. Phytoremediation is an effective and low cost interesting technology. Sugarcane could be a promising candidate for phytoremediation on metal contaminated soils due to its high biomass, faster growth and moderate take up and accumulation of heavy metals such as Cu, Cd, Se, Pb, and Mn.as the follow-up processing of sugarcane, bagasse could adsorb heavy metal ions in aqueous solutions and some new directions for further such as plant microorganisms associations phytoremediation were also prospected.

5. CONCLUSION

From these few success studies mentioned above, it could be concluded that, Phytoremediation is a yet another emerging technology with good efficiency for treating effluents and should be encouraged, so that it can be applied practically so that water and soil resources can be restored in situ. It is green technology which uses plants for remediation and thus would prove to be a safe technology for restoring environment. Compared to the expensive conventional techniques solar driven Phytoremediation is ecologically a better and promising choice with bright future. Efforts should be focused on exploring and utilizing this technology to get treated water meeting the standards and thus conserve the environment aiming a sustainable development and reduce stress on natural resources.

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