2223

CHAPTER 9

THE ROLE OF MACROPHYTE PLANTS IN CLEANING MECHANISM OF HEAVY METAL CONTAMINATION BY PHYTOREMEDIATION PROCESS: A REVIEW

Dr. V. K MUKKE
Department of Environmental science
Shivneri Mahavidyalaya Shirur Anantpal, Dist. Latur

ABSTRACT

Heavy metals are toxic, non-biodegradable chemical pollutants release into environment. Contamination of heavy metal in land and water ecosystem causes an extreme hazard to fresh water biota. Due to financial burden and consequences of established methods and techniques compel for shifting onto natural method of removal i.e. phytoremediation. In this method the plant species are employed to remove heavy metal contamination of land and soil. This is a cost effective and ecofriendly method for the removal of environmental contamination by heavy metal. Objective of the current paper review is to see and highlight the role and effectiveness of macrophyte plants used in the removal of heavy metal from water and land.

INTRODUCTION

The load of chemical waste has been increased tremendously in the environment during the past decades with the rapid expansion of Urbanization and industrialization. It's become a life

978-93-91842-80-2

threading alarm for the coming generation. Heavy metals are group of metallic compounds possesses moderately high atomic numbers, high atomic weight and high densities. The most commonly found heavy metals or metalloids are mercury, cadmium, Arsenic, zinc, lead, nickel, chromium. The source of heavy metals or their metalloids are natural or manmade activities such as waste generated from different chemical industries and their effluent discharge.

Since heavy metals are non-biodegradable in nature and subsist in the environment for long time. The leftover heavy metal ions are absorbed and accumulated in plants and animal's body via food chain is called as biomagnifications. The consumption of contaminated food with heavy metals causes serious health problems in human and death may occur in some cases. Minamata disease and death casualty in Japan due to mercury poisoning is the best example of heavy metal toxicity. Therefore, elimination of heavy metal contamination from soil and water becomes a priority. Adoption of an eco-friendly approach i.e. phytoremediation technique is a successful mean to handle the heavy metal contamination in land and water naturally with very low cost.

Elimination of heavy metal ions from any waste water body is of great concern in context to protect environment and public health. Methods involved in the elimination of heavy metals from aquatic bodies comprises of ion exchange, reverse osmosis, adsorption, electro dialysis, etc. Most of the above technologies are very expensive and energy demanding and specific to metal ions contents. During the last decades, biological methods of heavy metal removal have been developed and being used is called as bio-absorption or bioaccumulation. This is highly reasonable among the existing treatment methods of heavy metal removal.

For uptake and storage of heavy metals aquatic plants like Ciperus alopecuroides, Eichhornia crassipes, Ludwigia stolonifera,

978-93-91842-80-2

and Echinochloa stagnina were selected for bioaccumulation. These plants are able to absorb and remove heavy metal ions. The absorption and accumulation of heavy metal ions depends upon the types of chemical species available in the soil or water. Also depends upon the types of aquatic species engaged in removal process such as floating plants, rooted plants or rootless plants.

Phyto-remediation of the heavy metals can be easily attained by aquatic plant species as they engage in bio-absorption and bioaccumulation of heavy metal ions from waste water. In aquatic phyto-remediation system, plants may be floating on water surface or they may be submerged in water fully or partially. These floating plants root and whole submerged plants involved in the absorption and accumulation of metals. It is reported that the aquatic macrophyte are able to accumulate heavy metal ions from the environment.

Disposing industrial waste water to land and nearby water reservoir has come out as a routine exercise for some industries. The continuous discharge of industry effluent in water bodies and open land causes ill effect on human health. Elimination of heavy metals contamination using plants is a cheaper method in waste water treatment.

There are different types of phytoremediation methods which are useful in the removal of heavy metal from soil and water, such as i) phytofiltration- In this method hydroponically cultured plants are used to absorbs heavy metals from soil. ii) Phytovolatization- In this method the plants are used to absorbs heavy metals and emits them into the atmosphere in volatile forms. iii) Phytoextraction- plants are used to pull out and eliminate heavy metals from waste water and soil, and iv) Phytostabilization- Macroplants are used in reducing heavy metal bioavailability in soil.

CONCLUSION

These days application of phytoremediation technology has been executed successfully in some natural and constructed wetland with the help of macrophyte plants species. Along with macrophyte plants there are some microbial strains involved in the elimination of heavy metals. It is seen that the plants mentioned above are capable of eliminating heavy metal contamination from soil and water. It is proved that the Phytoremediation of heavy metals is a cost-effective natural technology in the treatment of wastewater.

REFERENCES

1. Ashraf, S., Ali, Q., Zahir, Z. A., Ashraf, S., and Asghar, H. N. (2019). Phytoremediation: environmentally sustainable way for reclamation of heavy metal polluted soils. Ecotox. Environ. Safe. 174, 714–727. doi: 10.1016/j.ecoenv.2019.02.068.
2. Begum, A., HariKrishna, S., 2010. Bioaccumulation of trace metals by aquatic plants. Int. J. ChemTech Res. 2 (1), 250-254.
3. Suman, J., Uhlik, O., Viktorova, J., and Macek, T. (2018). Phytoextraction of heavy metals: a promising tool for clean-up of polluted environment? Front Plant Sci. 9:1476. doi: 10.3389/fpls.2018.01476.
4. https://www.frontiersin.org/articles/10.3389/fpls.2020.00359/full#B128
5. https://www.sciencedirect.com/science/article/abs/pii/S2215153221000842
6. https://www.researchgate.net/publication/331088568_
7. https://www.ncbi.nlm.nih.gov