Article available online at http://www.jtim.biosci.in

Journal of Traditional and Integrative Medicine

Journal homepage: http://www.jtim.biosci.in, Vol 3, Issue 1, 2020 (Jan-Mar)

Review Article

Heavy metals removal from soil by the plants- review.

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ARTICLE INFO

Article history:
Received January 2020
Received in revised form
February 2020
Accepted March 2020

Keywords:
Heavy metals
Soil contamination
Phytoremediation
Plants

Pages: 292-297

ABSTRACT

Soils may become contaminated by accumulation of heavy metals. Those metals constitute an ill-defined group of inorganic chemical hazards, and those most commonly found at contaminated sites are Lead (Pb), chromium (Cr), arsenic (As), zinc (Zn), cadmium (Cd), copper (Cu), mercury (Hg), and nickel (Ni). The presence of toxic metals in soil can severely inhibit the biodegradation of organic contaminants. to enumerate the heavy metals in soil, to find out the plants which were used to *Phytoremediation*. Technologies for remediation of heavy metal-contaminated soils.1) Isolation 2) Immobilization 3) Toxicity and/or mobility reduction: phytoremediation (phytoextraction, phytostabilization, and rhizofiltration) 4) Physical separation 5) Extraction. In this research only considered *Phytoremediation*. It is called green remediation, botanoremediation, agroremediation, or vegetative remediation, can be defined as an *in-situ* remediation strategy that uses vegetation and associated microbiota, soil amendments, and agronomic techniques to remove, contain, or render environmental contaminants harmless. The methods used to phytoremediate metal contaminants are slightly different from those used to remediate sites polluted with organic contaminants. according to this study following plants were identified as working *Phytoremediation:* Brassica *juncea* L.- Cd, Cu, Zn, Pb. *Brassica napus* L.- Cd, Cu, Zn, Pb. *Cajanus Cajan* (L.) Milsp.- As, Cd. *Cicer aeritinum* L.- Cd, Pb, Cr, Cu. *Jatropha curcas* L.- Fe, Al, Cu, Mn, Cr, As, Zn, Hg. *Lantana camara* L.- Pb. etc. heavy metals & metalloids through emissions from the rapidly expanding industrial areas, mine tailings, disposal of high metal wastes, leaded gasoline and paints, land application of fertilizers, animal manures, sewage sludge, pesticides, wastewater irrigation, coal combustion residues, spillage of petrochemicals, and atmospheric deposition. The methods used to phytoremediate metal contaminants are slightly different from those used to remediate sites polluted with organic contaminants. Therefore, above identified plants used to purify the soil by rolling of cultivation and changing the crop pattern and organic manure application of farming field is strongly recommended in this research.

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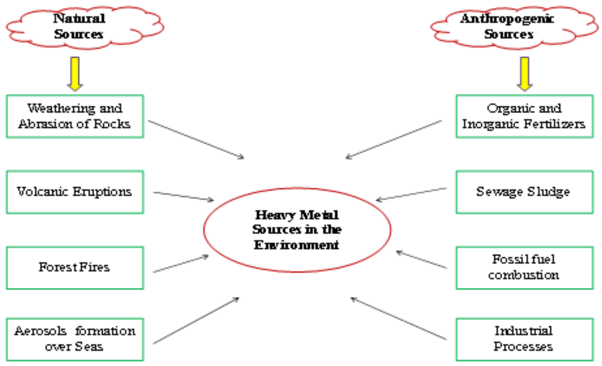
DOI: 10.1016/j.tim.2020.

INTRODUCTION

The concept of using plants to clean up contaminated environments is not new. About 300 years ago, plants were proposed for use in the treatment of wastewater (Hartman,1975). At the end of the 19th century, *Thlaspi caerulescens* and *Viola calaminaria* were the first plant species documented to accumulate high levels of metals in leaves (Baumann,1885). In 1935, Byers reported that plants of the genus *Astragalus* were capable of accumulating up to 0.6 % selenium in dry shoot biomass. One decade later, Minguzzi and Vergnano (1948) identified plants able to accumulate up to 1% Ni in shoots. More recently, Rascio, (1977) reported tolerance and high Zn accumulation in shoots of *Thlaspi caerulescens*. Despite subsequent reports claiming identification of Co, Cu, and Mn hyperaccumulators, the existence of plants hyperaccumulating metals other than Cd, Ni, Se and Zn has been questioned and requires additional confirmation (Salt et al., 1995). The idea of using plants to extract metals from contaminated soil was reintroduced and developed by Utsunamyia (1980) and Chaney (1983),and the first field trial on Zn and Cd phytoextraction was conducted in 1991 (Baker et al.). In the last decade, extensive research has been conducted to investigate the biology of metal phytoextraction. Despite significant success, our understanding of the plant mechanisms that allow metal extraction is still emerging. In addition, relevant applied aspects, such as the effect of agronomic practices on metal removal by plants are largely unknown. It is conceivable that maturation of phytoextraction into a commercial technology will ultimately depend on the elucidation of plant mechanisms and application of adequate agronomic practices. Natural occurrence of plant species capable of accumulating extraordinarily high metal levels makes the investigation of this process particularly interesting.

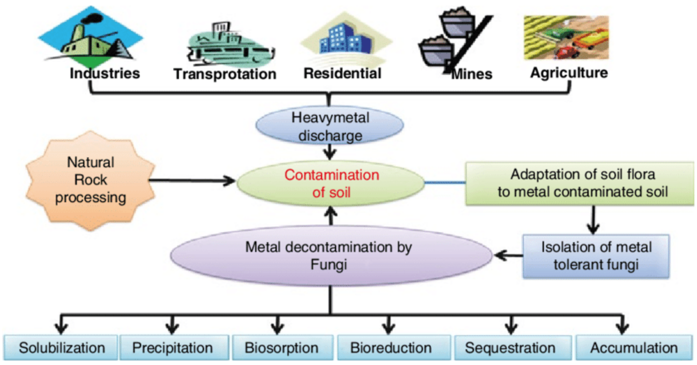
Advantages and disadvantages of phytoremediation: Metal-contaminated soils are notoriously hard to remediate. Current technologies resort to soil excavation and either

landfilling or soil washing followed by physical or chemical separation of the contaminants. The cost of soil remediation is highly variable and depends on the contaminants of concern, soil properties, and site conditions. Cleaning of metal-contaminated soils via



conventional engineering methods can be prohibitively expensive (Salt et al., 1995).

Objectives of this research: To enumerate the heavy metals in soil, To find out the plants which were used to *Phytoremediation.*



METHODOLOGY

Research Type:

- Literature Review

Research Design:

- Collection of research papers from reputed international journals from journal hub as; Google Scholar, Scopus, Science Direct, Pubmed, etc.

RESULTS

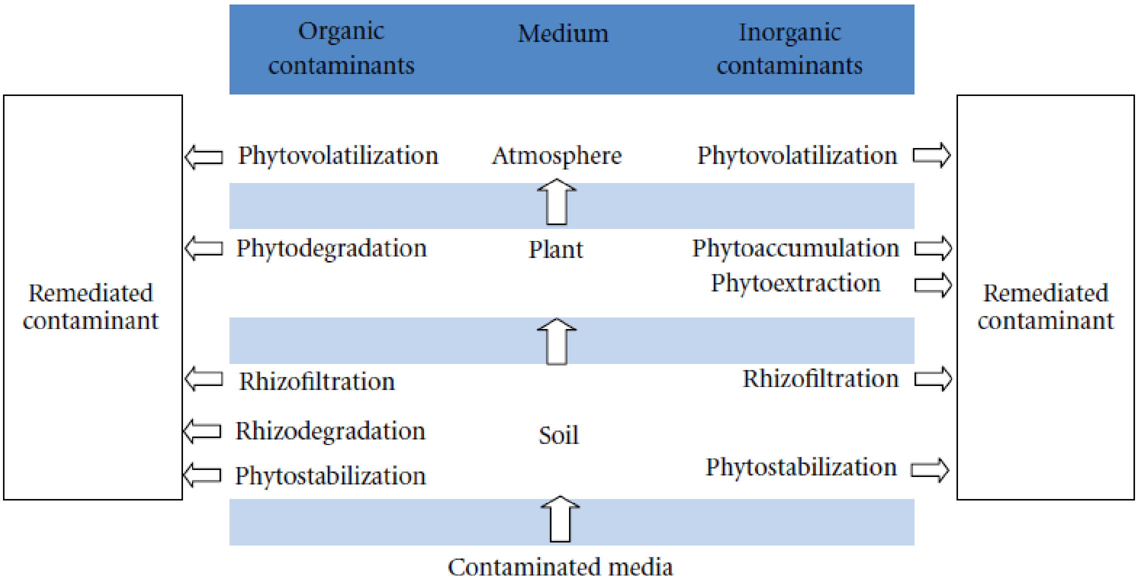
Technologies for remediation of heavy metal-contaminated soils.

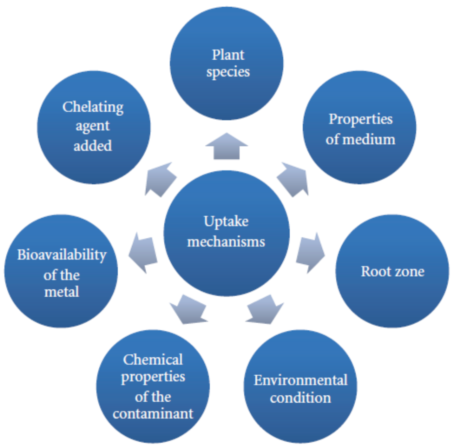
1) Isolation
2) Immobilization
3) Toxicity and/or mobility reduction: phytoremediation (*phytoextraction, phytostabilization, and rhizofiltration*)
4) Physical separation
5) Extraction

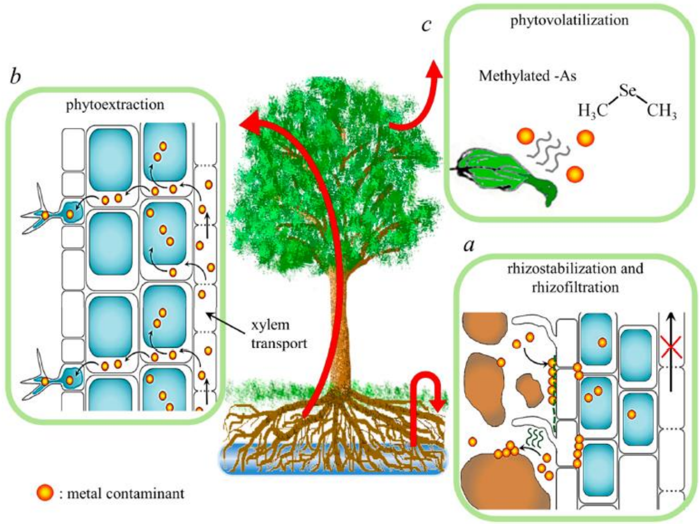
In this research only considered *Phytoremediation.*

It is called green remediation, botano-remediation, agro-remediation, or vegetative remediation, can be defined as an *in situ* remediation strategy that uses vegetation and associated microbiota, soil amendments, and agronomic techniques to remove, contain, or render environmental contaminants harmless. Plants may break down or degrade organic pollutants or remove and stabilize metal contaminants.

The methods used to phytoremediate metal contaminants are slightly different from those used to remediate sites polluted with organic contaminants.







According to this study following plants were identified as working *Phytoremediation:*

- *Brassica juncea* L.- Cd, Cu, Zn, Pb
- *Cajanus Cajan* (L.) Milsp.- As, Cd
- *Cicer aeritinum* L.- Cd, Pb, Cr, Cu
- *Jatropha curcas* L.- Fe, Al, Cu, Mn, Cr, As, Zn, Hg
- *Lantana camara* L.- Pb
- *Lens culinaris* Medic.- Pb
- *Lepidium sativum* L.- As, Cd, Fe, Pb, Hg
- *Lactuca sativa* L.- Cu, Fe, Mn, Zn, Ni, Cd, Pb, Co, As
- *Oryza sativa* L.- Cu, Cd
- *Pisum sativum* L.- Pb, Cu, Zn, Fe, Cd, Ni, As, Cr
- *Rapanus sativus* L.- As, Cd, Fe, Pb, Cu

- *Spinacia oleracea* L.- Cd, Cu, Fe, Ni, Pb, Zn, Cr
- *Solanum nigrum* L.- Cd
- *Sorghum bicolor* L.- Cd, Cu, Zn, Fe
- *Zea mays* L.- Cd, Pb, Zn, Cu

CONCLUSION

Heavy metals & metalloids through emissions from the rapidly expanding industrial areas, mine tailings, disposal of high metal wastes, leaded gasoline and paints, land application of fertilizers, animal manures, sewage sludge, pesticides, wastewater irrigation, coal combustion residues, spillage of petrochemicals, and atmospheric deposition.

The methods used to phytoremediate metal contaminants are slightly different from those used to remediate sites polluted with organic contaminants. Therefore, above identified plants used to purify the soil by rolling of cultivation and changing the crop pattern and organic manure application of farming field is strongly recommended in this research.

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