

Phytoremediation, a Green, Clean Technology and Effect of Heavy Metals on Morphology of Hyperaccumulator Plants

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ABSTRACT

Phytoremediation is the use of green plants to remediate the contaminants present in soil, water, air, land etc. Heavy metals are hazardous to plants, animals and human beings etc. Heavy metals like Cadmium (Cd), Lead(Pb), Chromium(Cr), Arsenic (As), Uranium(Ur), radionuclides are harmful and damages anatomical features of plants animals and human beings. Processes and mechanism of Phytoremediation are Phytoextraction, Phytostabilization, Rhizofiltration, Phytodegradation, Phytostimulation etc. Heavy metals at very low concentration effect very less but at slight higher concentration effect the Phytoremediator plants, shows the morphological effect like decrease in leaf number, leaf area, chlorosis, reduction's in root and shoot lengths, slight increase and then decrease of dry weight of plant and its aerial parts. Hyperaccumulator plants tolerate a wide range of heavy metals .Brassica juncea(Mustard). Solanum Lycopersicon esculentum (Tomato). Sunflower (Helianthus annus). Eicchornea crassipes (Water hyacinth) studied as hyperaccumulator plants.

Keywords-Phytoremediation,Heavy metals,dry weight, Rhizofiltration.

I INTRODUCTION

Phytoremediation is the use of green plants to remediate the contaminants present in the soil,water,air etc.Phytoremediation Greek word means "Phyto" means "plant"and "remediation""recovery" or" removal". Phytoremediation consists of the various processes ie mechanisms ie Phytoextraction, Phytostabilization, Phytodegradation, Rhizofiltration, Phytostimulation(1-8) etc.Increase, Decrease of Biomass bor dry weight of plant or its aerial parts shows the remediation of heavy metals and other

contaminants. Hyperaccumulator plants have a tendency to tolerate wide range of heavy metal concentration in their aerial parts. Different plants shows different types of Phytoremediation technique.

Hyperaccumulator plants-Lycopersicon esculentum (Tomato), Brassica juncea (Mustard) Helianthus annus (Sunflower),Eicchornea crassipes(Water hyacinth).

Plants-Lycopersicon esculentum (Tomato), Brassica juncea (Mustard) Helianthus annus (Sunflower),Eicchornea crassipes(Water hyacinth).

II OBJECTIVES AND METHODOLOGY

(a) Objective

- (i) To study the Phytoremediation technology, heavy metals, hyperaccumulator plants and to study the effect of heavy metals on morphological features of plants,leaf no. of plants.To study the formula of translocation factor and tolerance level of plants.It is Shoot/Root ratio and Shoot/Soil ratio of plants.
- (ii) To study root, shoot lengths, tolerance level

- (iii) To remediate the heavy metals by Phytoremediation technology and to clean the environment by Phytoremediator plants

- (b) **Experiment & Objectives** -Plants are grown in pots and treated with heavy metals (Pb,Cr,Cd),leaf area,leaf number and dry weight,fresh weight,biomass is observed after keeping plants for few days.(p less than 0.05). TF greater than 1 suggests higher remediation of heavy metals suggests higher remediation of heavy metals. Fresh and Dry weights after treatments on different plants after treatment with heavy metals are shown on tables 1 to 4 and graphically represented at figure 1 to 4.

Tables No. 1

Fresh, dry weight of root, shoot of Cadmium treated Brassica juncea.

Control	Shoot fresh weight	Shoot dry weight
0	45	11
100Cd,mg/l	37	9
200Cd,mg/l	30	7
	Root fresh weight	Root dry weight
100Cd,200Cd,(mg/l).	14,11	4.5,3.2

Table No. 2
Fresh weight, Dry weight in g/seedling of lead treated Eicchornea crassipes

mg/l lead	Fresh weight	Dry weight
Control	10.03	0.72
100	9.95	0.71
200	9.63	0.64
400	8.83	0.56

Table No. 3
Tomato plant Fresh and dry weight of root ,shoot of lead treated plant.

Lead mg/l	Root	Shoot
Control	Fresh,Dry weight	Fresh,Dry weight
150	1.95,0.66	6.1,1.87
300	1.49,0.58	4.1,1.4

Table No. 4
Fresh and Dry weight of Chromium treated root,shoot of Sunflower (Helianthus annus).

Cr treated sunflower	mg	Root weight	fresh ,dry	Shoot weight	fresh,dry
50		1.16,0.48		9.69,1.38	
100		2.23,0.19		11.49,1.78	

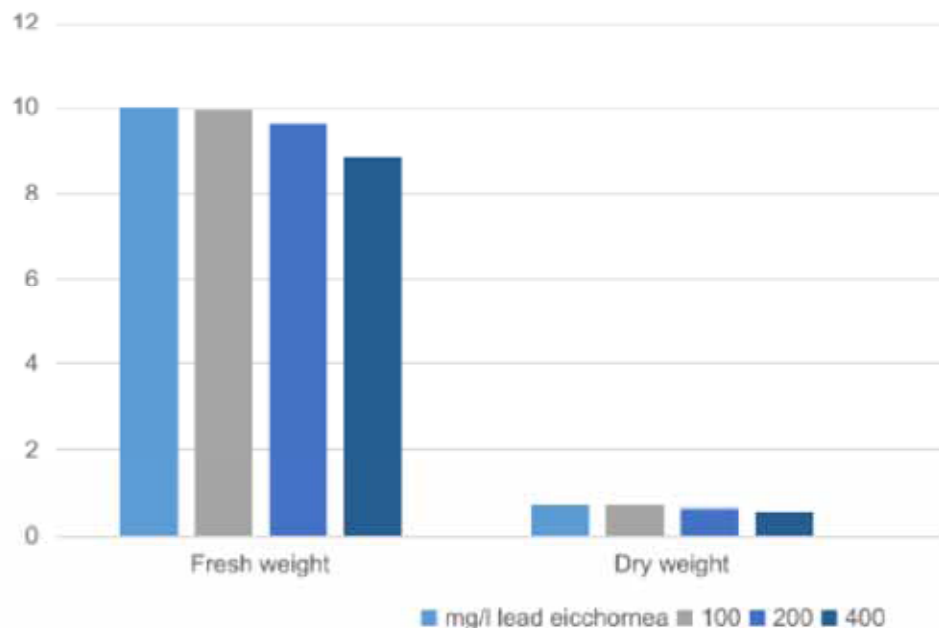


Fig No.1 Fresh and Dry weight of root, shoot of Eicchornea crassipes (Water Hyacinth).

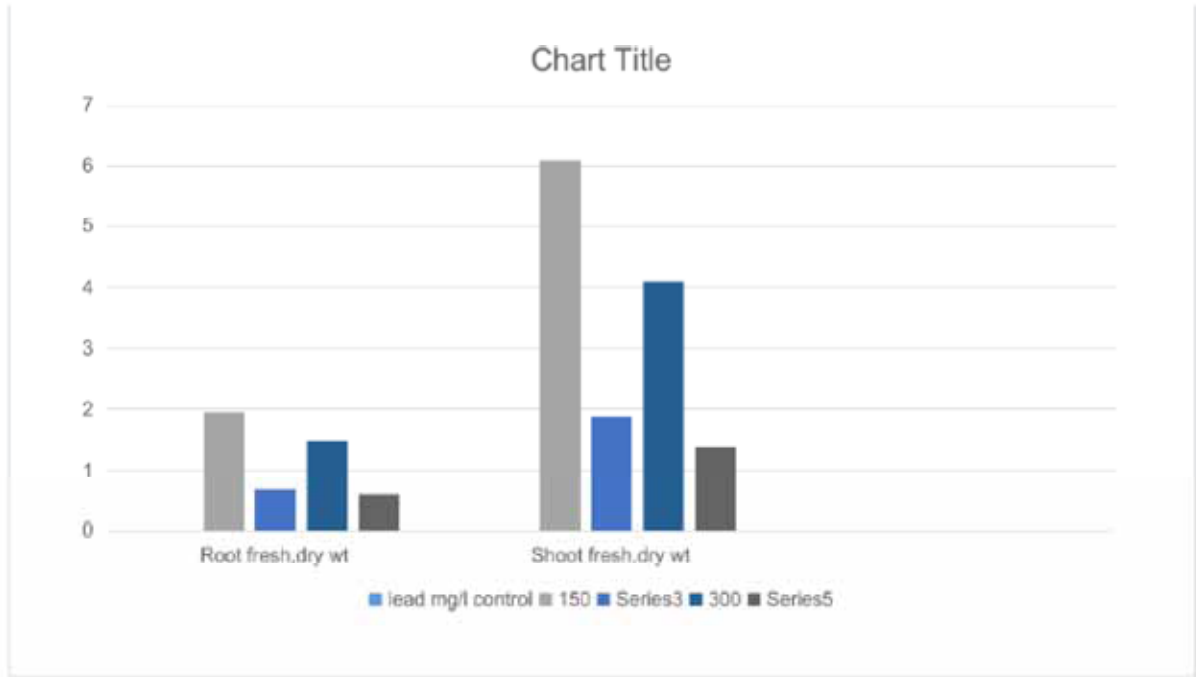


Fig No. 2 Fresh and Dry Weight of root, shoot of Lycopersicon esculentum (Tomato plant) of lead treated Plant.

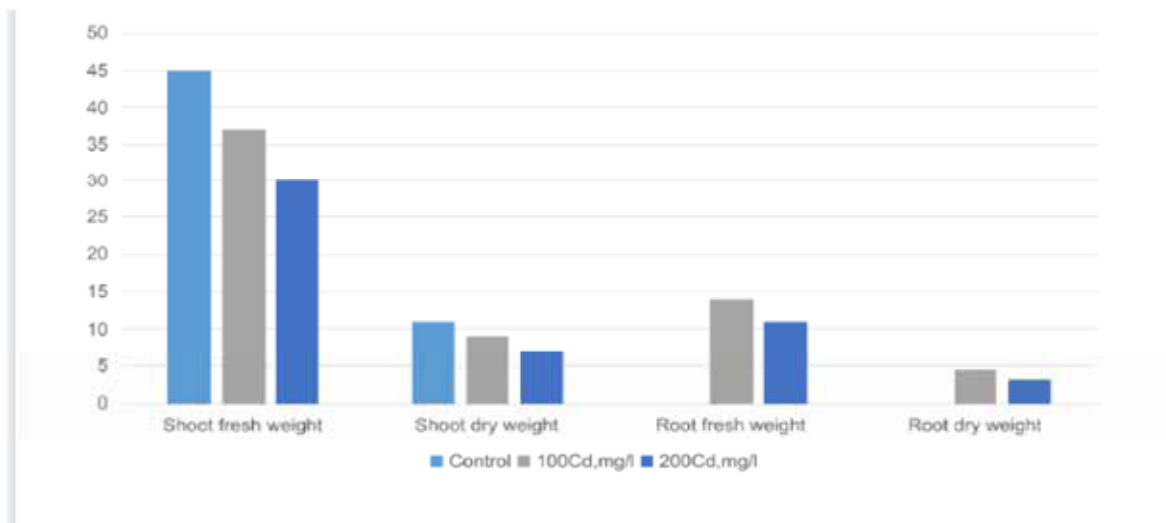


Fig No. 3 Fresh and Dry weight of root, shoot of Brassica juncea (Mustard) Plant.

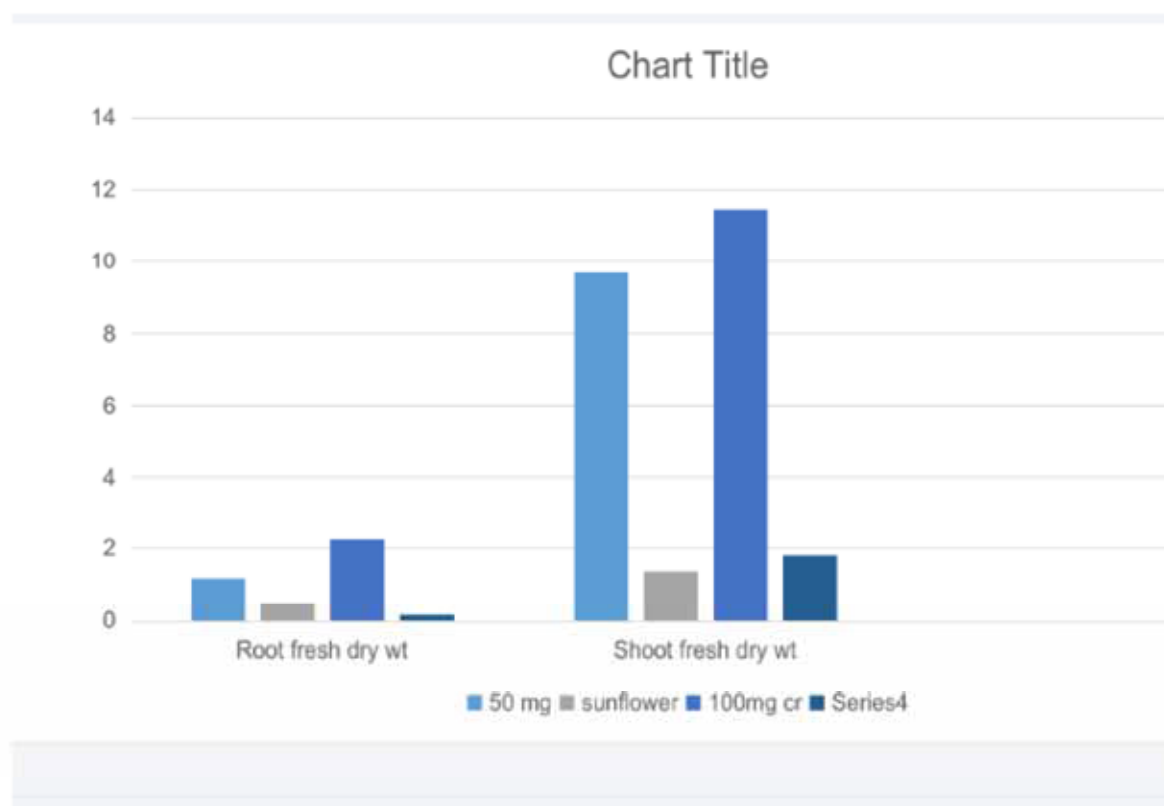


Fig No. 4 Fresh and Dry weight of root, shoot of Helianthus annus (Sunflower) of Chromium treated Plant.

III RESULT & DISCUSSIONS

Slight increase and then decrease of dry weight of the plant and aerial parts of the plants taken suggests that the transfer of heavy metals from root to shoot, on increasing concentration of heavy metals. Leaf area and number also decreases at slight higher concentration of heavy metals. In this way contamination of soil, water is damaging the environment. Photosynthetic rates decreases by the effect of heavy metals.

Future prospects-Phytoremediation is a cost effective technology and has wide applications. The process is helpful in cleaning of environment. Transgenic plants are helpful in technology and helpful in near future.

IV CONCLUSION & APPLICATION

A decrease in yield, dry matter, dry weight, and lengths of plant and its root and shoot. Leaf area and leaf number decreases, chlorosis is also observed in plant leaves and its parts. As the concentration of heavy metals increases, dry weight or biomass at very

low concentration slight increases and then decreases. The process is helpful in cleaning soil, water, air, land and also remediation of heavy metals and other contaminants.

REFERENCES

- [1] Rohman Razzaq R, 2017: Rev. On Phytoremediation: Env: friendly tech.
- [2] Sadique Abdurrahman: Rev. on Heavy Metal Contamination in Water, Soil, effects, sources and Phytoremediation Techniques.
- [3] 327, aug 2013 Rev. on EDTA Enhanced Phytoremediation of Heavy Metals, 27 aug. 2013.
- [4] N Sarwar; 2017: Rev. Phytoremediation strategies for soils contaminated with heavy metals.
- [5] Hazrat Ali, Ezzat Khan et al : Rev. On Phytoremediation of heavy metals concepts and applications.