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Phytoremediation of Heavy Metal from Polluted Water Using Bacopa Monnieri

Hepsi Swarupa Rani Guduri[1], Dr.C. Sarala [2]

[1] Research Scholar, Centre for Water Resources, Jawaharlal Nehru Technological University, Hyderabad

[2]Professor, Centre for Water Resources, Jawaharlal Nehru Technological University, Hyderabad

***Abstract* - Water is essential natural resources for human life. Increase in water demand poses new tasks for water resources organizers to keep pace with the increase in population. It is essential for sustaining all forms of life, food production and economic development and for all general wellbeing. Heavy metals are among the most important sorts of contaminant in the environment. Currently, phytoremediation is an effective and affordable technological solution used to extract or remove inactive metals and metal pollutants from contaminated water. This technology is environmentally friendly and potentially cost effective. This paper aims to compile some information about heavy metal of Cadmium (Cd) effects and their treatment. It also reviews deeply about phytoremediation technology, including the heavy metal uptake mechanisms and several research studies associated about the topics and also heavy metal uptake mechanisms in phytoremediation technology as well as the factors affecting the uptake mechanisms. Some recommended plants which are commonly used in phytoremediation and their capability to reduce the contaminant are also reported.**

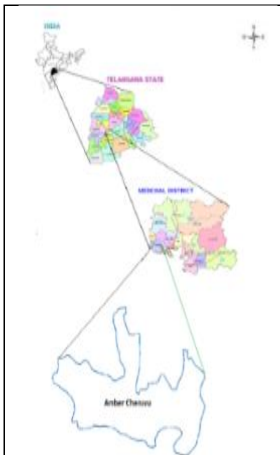
***Index Terms* - Aquatic plants, Heavy metals, Phytoremediation, Surface water sample.**

I.INTRODUCTION

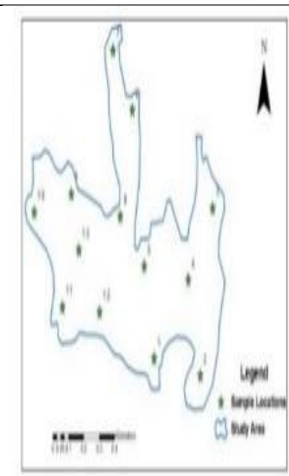
Water scarcity has been increasing all over the world and in many countries may become absolute by the year 2025.This problem becomes more apprehensive when recognizing that the severity of surface water pollution is a worldwide problem. To tackle the problem, several measures for sustainable water resource utilization have been developed, of which polluted surface water reclamation is currently one of the top priorities. It was reported that domestic and Industrial discharges are probably the two most important anthropogenic sources for metals in the water environment. This causes pollution problems such as depletion of dissolved oxygen, eutrophication and public health hazards.

II. STUDY AREA

This guideline is used for all journals. These are the manuscript preparation guidelines used as the study area is located in Pragathi Nagar, Hyderabad, Medchal- Malkajgiri district in Telangana state, India. Pragathinagar is surrounded by Hyderabad mandal towards south, Medchalmandal towards north, Shamir Pet mandal towards east Ramchandrapuram mandal towards west covering an area of 3.4 km^2.The study area is amber Cheruvu lake covering an area of 0.906 km^2 which lies between 17. 509961°N to 17.535035° North latitude and 78. 390156°E to 78.401379 East longitude. It has an average elevation of 33 meters (108 ft.). The climate of Pragathinagar is subarctic, with short and fairly warm summers.



Location Map of the Study area



Sample location of the study area

Name of the Sample Locations

Sample No.	Name of the Sample Location
1	PEDDA NALLA STARTING
2	PEDDA NALLA ENDING
3	PEDDA BANDA
4	ALLUGU
5	ALLUGU -I
6	ALLUGU- II
7	PRAGATHI NAGAR BRIDGE STARTING
8	PRAGATHI NAGAR BRIDGE ENDING
9	NEAR FISH MARKET BEGINNING
10	NEAR FISH MARKET ENDING
11	SOFIT 1
12	SOFIT 2
13	HERITAGE BUS STOP

Figure I Location Map of the Study area

III. METHODOLOGY

Thirteen surface water samples were collected from the amber Cheruvu lake during post monsoon and pre monsoon periods of January 2015, June 2015. The surface water samples were analyzed for heavy metal name Cadmium. The heavy metal was analyzed by using Atomic Absorption Spectrometer and the obtained values are compared with IS:10500 standards. Surface water samples were treated for the heavy metal by adopting Phyto-remediation method. For the present study area, the Phyto-remediation method is carried out by using aquatic plant Bacopa Monnieri.

A. Phytoremediation

Phytoremediation is a cost-effective plant-based approach of remediation. It takes the 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 hyperaccumulators to 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 mechanisms of phytoremediation began to emerge in recent years together with biological and engineering strategies designed to optimize and improve phytoremediation. The feasibility of using plants for environmental cleanup was carried out worldwide.

B. Results and Discussion

The surface water samples were analyzed for Cadmium during post monsoon and pre monsoon periods of January 2015, June 2015.

Table: I Metal Analysis for the Study Area

	Cadmium Metal Values in mg/l		
Name of the Sample Location	IS 10500 Standard	Jan-15	Jun-15
PEDDA NALLA STARTING	0.03mg/l	0.28	0.2007
PEDDA NALLA ENDING		0.512	0.2521
PEDDA BANDA		0.46	0.639
ALLUGU		0	0
ALLUGU -I		0.212	0.064
ALLUGU- II		0.2004	0.2305
PRAGATHI NAGAR BRIDGE STARTING		0.1928	0.1867
PRAGATHI NAGAR BRIDGE ENDING		0	0
NEAR FISH MARKET BEGINNING		0.07	0
NEAR FISH MARKET ENDING		0.053	0
SOFIT 1		0.028	0
SOFIT 2		0.015	0.021
HERITAGE BUS STOP		0.028	0.045

C. Removal of Heavy Metals by Phyto-remediation:

In the study area the aquatic plant Bacopa Monnieri is used to removal heavy metal concentration in the collected surface water samples. The graphs are prepared for the percentage efficiency of heavy metal removal by each aquatic plant for all the water samples collected during the post monsoon and pre monsoon periods.

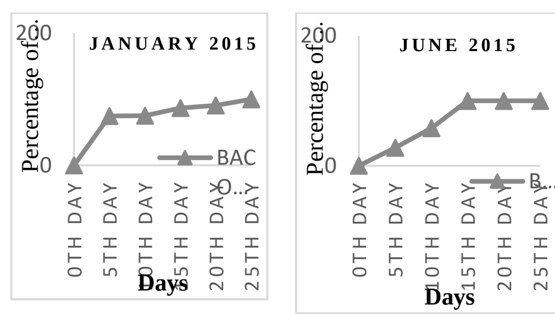


Figure: C.I. Removal Efficiency of Cadmium Metal for Sample 1

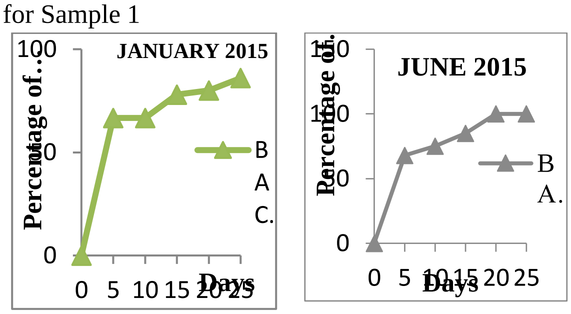


Figure: C.II. Removal Efficiency of Cadmium Metal for Sample 2

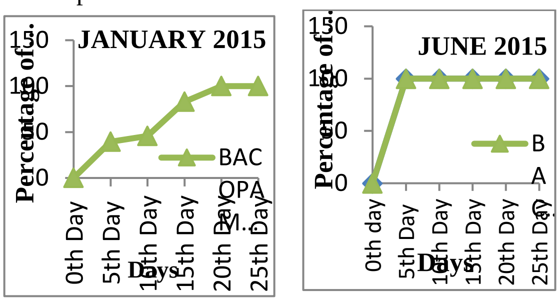


Figure: C.III. Removal Efficiency of Cadmium Metal for Sample 3

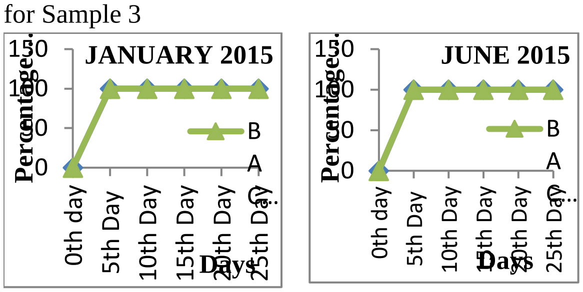


Figure: C.IV. Removal Efficiency of Cadmium Metal for Sample 4

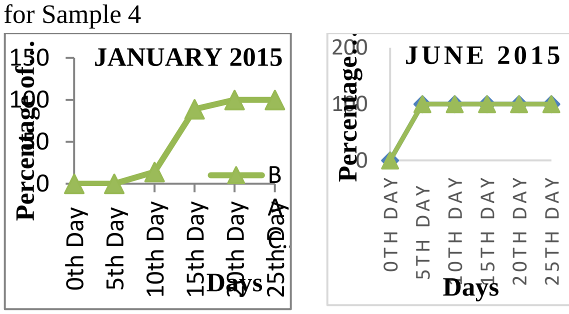


Figure: C.V. Removal Efficiency of Cadmium Metal for Sample 5

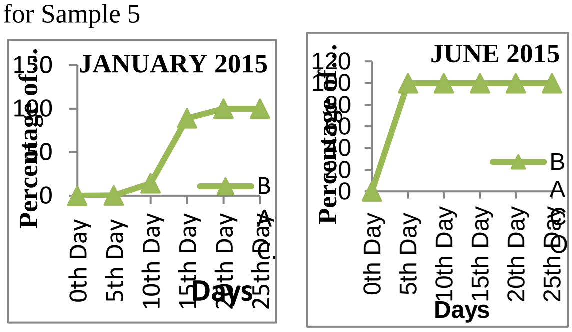


Figure: C.VI. Removal Efficiency of Cadmium Metal for Sample 6

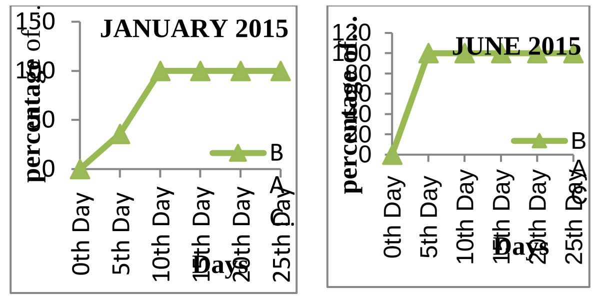


Figure: C.VII. Removal Efficiency of Cadmium Metal for Sample 7

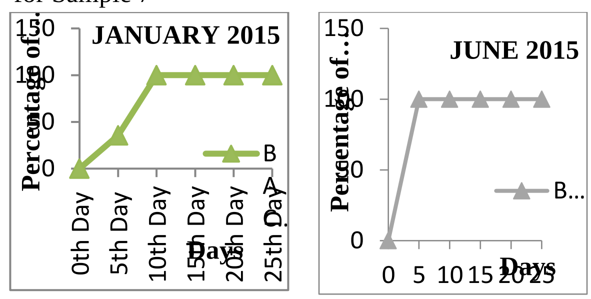


Figure: C. VIII. Removal Efficiency of Cadmium Metal for Sample 8

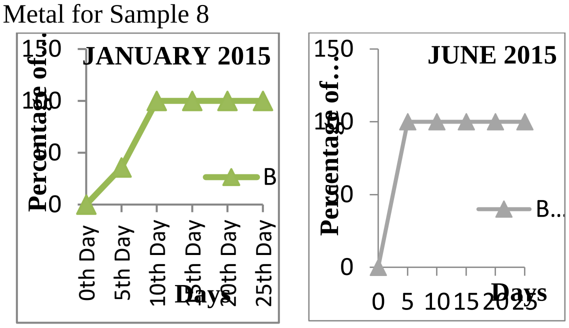


Figure: C. IX. Removal Efficiency of Cadmium Metal for Sample 9

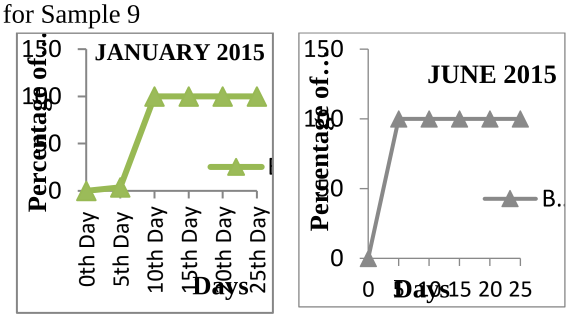


Figure: C.X. Removal Efficiency of Cadmium Metal for Sample 10

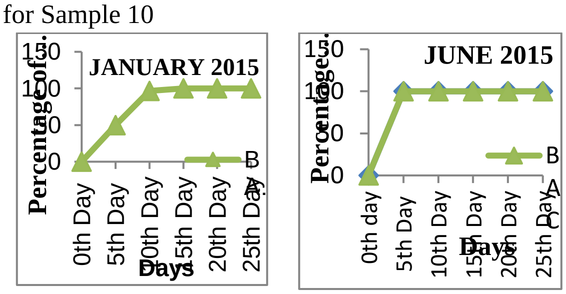


Figure: C. XI. Removal Efficiency of Cadmium Metal for Sample 11

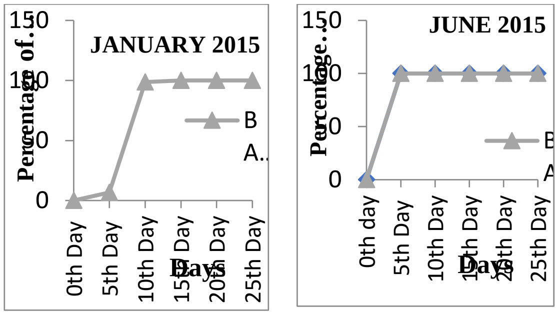


Figure: C.XII. Removal Efficiency of Cadmium Metal for Sample 12

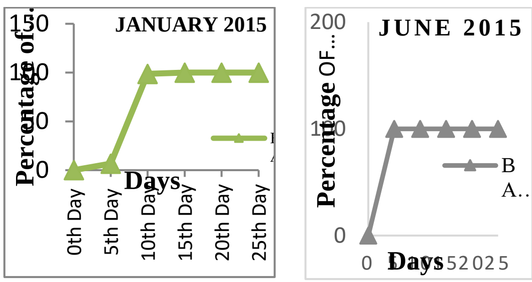


Figure: C. XIII. Removal Efficiency of Cadmium Metal for Sample 13

D. Abstract of the Heavy metals Removal in the Study area by Phyto-remediation

Cadmium heavy metal can be completely removed in the polluted surface water by growing Bacopa Monnieri aquatic plants. Below Table: II shows Cadmium Metal Removal in the Study area by Phyto-remediation

Table: II. Cadmium Metal Removal in the Study area by Phyto-remediation

Duration	Name of Heavy Metal	100 Percent Removal Efficiency of Aquatic Plant	Sample Location
Jan-2015	CADMIUM	Bacopa Monnieri 20th Day	1,2,3,4,5,6,7,8,9,10,11,12,13
June-2015	CADMIUM	Bacopa Monnieri 5th Day	1,2,3,4,5,6,7,8,9,10,11,12,13

IV. CONCLUSIONS

The Cadmium values in the study area varied between 0 – 0.6 mg/l. The highest value is observed at Peddanalla Ending during January 2015.In the pre monsoon and post monsoon period samples of 2015, the Cadmium metal can be removed completely by using Bacopa Monnieri by 5th Day. The leftover biomass of all these aquatic plants can be used for vermi composting and to increase the yield of fish in aquaculture.

REFERENCE

[1] Soltan M. E., Rasheed M. N., Laboratory study on the survival of water hyacinth under several conditions of heavy metal concentrations, Adv. Environ. Res 7(2) 321-334(2003)

[2] Lopez A., Lazaro N., Morales S., Marques A.M. Nickel Biosorption by free and immobilized cells of Pseudomonas a Comparative Study, Water, Air, Soil pollution,135(1-4),157-172(2002)

[3] Garbisu C., Alkorta I., Phytoextraction: A cost effective plant-based Technology for the removal of metals from the environment, Bioresource Technol. 77(3),229-236, (2001)

[4] Cheng T., Allen H.E., Prediction of Uptake of Copper from solution by Lettuce. Environ. Toxicon. Chem. 20(11),2544-2551(2001)

[5] Zayed A., Gowtham S., Terry N., Phytoaccumulation of trace elements by wetland plants: I. Duckweed, Environ. Qual. 27(3)715-721 (1998)

[6] Tyler G., Pahlsson A. M., Bengtsson G., Baath E., Tranv L., Heavy metal ecology and Eke Tina terrestrial plants, microorganisms and invertebrates: a review Water Air Soil Pollution,47(3-4)189-215(1989)

[7] Zara Nyika M.F wadza T Uptake of Ni, Zn, Fe, Co, Cr, Pb, Cu and Cd by water hyacinth (eichhorniacrassipes) in mukuvisi and manyame rivers, Zimbabwe, Journal of “Environmental Science and Health”,157-169(1995)