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100 PERCENT REMOVAL EFFICIENCY OF AQUATIC PLANT FROM WASTE WATER

[1]Hepsi Swarupa Rani Guduri, [2]Dr.C.Sarala
[1]Research Scholar, [2]Professor
[1]Centre for Water Resources,
[1] Jawaharlal Nehru Technological University Hyderabad, Telangana, India.

Abstract: Water pollution has become one of the most serious problems of today's civilization. Lemnaceae is one of the aquatic plant species successfully used for wastewater treatment. It is very efficient in removing pollutant. This paper mainly focuses on the treatment of waste water by phytoremediation process using the plant 'Lemnaceae' and has given emphasis to the removal of heavy metals by the plant. Lemnaceae could grow in sewage; they absorb and digest the pollutants in wastewater, thus converting sewage effluents to relatively clean water. Thus, the plants hold promise as a natural water purification system, which could be established at a fraction of the cost of a conventional sewage treatment facility. The study conducted in this regard revealed how efficiently wastewater could be treated using the plant 'Lemnaceae'.

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

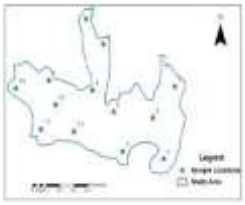
I. INTRODUCTION

II. Water is important natural resources are required for the sustainability of mankind in nature. However due to increased industrialization and urbanization these resources are facing severe pollution. Heavy metal pollution is a worldwide concern especially in water and all the countries throughout the world are severely affected by the above said problem. Heavy metals are the high density metallic chemical elements and are among the important class of contaminants in the environment. The concentration of heavy metals in the environment has increased as a result of various anthropogenic activities like burning of fossil fuels, discharge of municipal wastes, use of fertilizers and pesticides etc. This increase of heavy metal concentration is a major concern to both humans and ecosystem , because of their non-biodegradable nature. Instant and necessary measures are required to remediate such polluted systems of all the remediation technologies, phytoremediation has been preferred because of its cost-effective method, eco-friendly nature and simple maintenance. The main focus of this paper is to discuss the potential of phytoremediation technique to treat heavy metal contaminated sites, to provide information about the mechanisms adopted by plants for heavy metal uptake and also to give a brief list of aquatic plants efficient for remediation of heavy metal.

2. 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: 2.1. Location Map of the Study area

2.2. Objectives of the Present Study

To analyse the heavy metal present in the surface water samples.

2.3. Rearch Methodology

Thirteen surface water samples were collected from the amber Cheruvu Lake during the monsoon period of January 2015. The surface water samples were analysed for heavy metal name Copper. The heavy metal was analysed by using Atomic Absorption Spectrometer and the obtained values are compared with IS: 10500 standards. The 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 **Lemnaceae**

2.4. 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 clean-up was carried out worldwide. Aquatic plants are of special interest, because they are capable of bio-accumulating toxic metals and nutrients in large quantities in comparison to terrestrial plants are capable of removing the metal contamination from water. Aquatic plants of all types whether free floating, submerged or emergent's all are known for removing heavy metals. Phytoremediation is a well-planned clean-up technology for a variety of organic and inorganic pollutants. Plants extract metals, hydrocarbon compounds and man –made chemicals such as herbicides, fungicides, *pesticides* and antibiotics. Phytoremediation is an environmental friendly, cheap, efficient and most reliable as it helps to remove the contamination. Plants possess and use a variety of mechanisms to deal with the contaminations especially heavy metals, hydrocarbon compounds and man –made chemicals such as herbicides, fungicides, pesticides.

Figure: 2.4. Lemnaceae aquatic plant

3.1. Results and Discussion

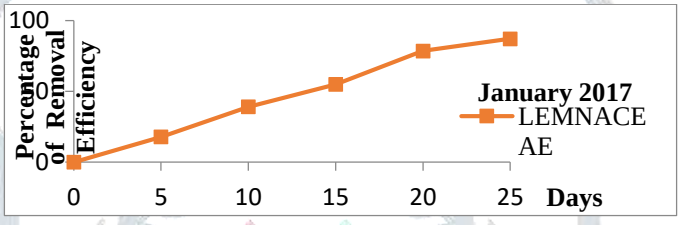
The surface water samples were analysed for Copper during the period of January 2017. The highest value observed at Heritage Bus Stop 4.8mg/l

Table:3.1 Metal Analysis for the Study Area

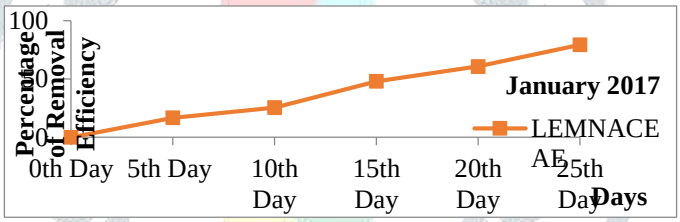
Sample Locations		PEDDA NALLA STARTING	PEDDA NALLA ENDING	PEDDA BANDA	ALLUGU	ALLUGU-I	ALLUGU- II	PRAGATHI NAGAR BRIDGE STARTING	NEAR FISH MARKET BEGINNING	PRAGATHI NAGAR BRIDGE ENDING	NEAR FISH MARKET ENDING	SOFIT 1	SOFIT 2	HERITAGE BUS STOP
Copper Metal Values in mg/l	**IS 10500 Standard**	**0.05 - 1.5 mg/l**												
	Jan-17	3.558	2.592	2.39	2.897	3.965	2.313	3.05	3.042	2.897	1.779	3.1	3.51	4.8

3.2 Removal of Heavy Metals by Phyto-remediation

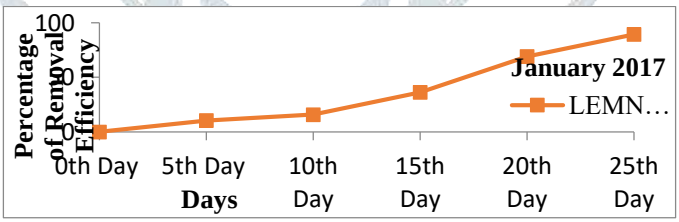
In the study area the aquatic plant **Lemnaceae** is used to removal heavy metal concentration in the collected surface water samples. The graphs are prepared for the percentage efficiency of heavy metal removal by each aquatic plant for all the water samples collected during the periods.



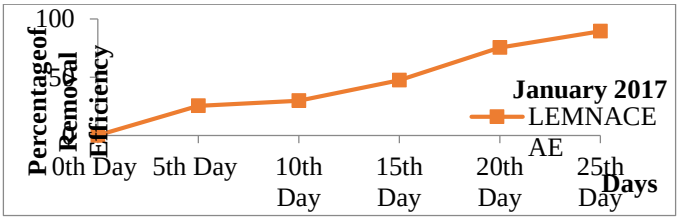
Removal Efficiency of Copper Metal for Sample 1



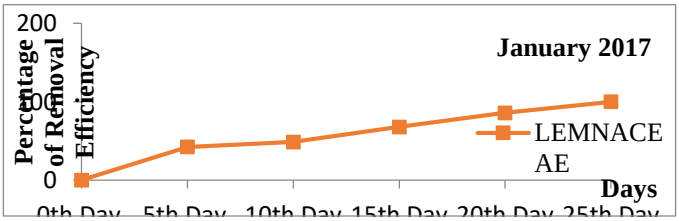
Removal Efficiency of Copper Metal for Sample 2



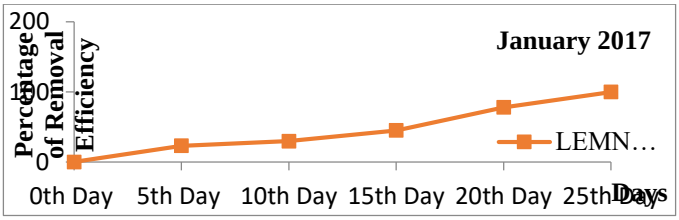
Removal Efficiency of Copper Metal for Sample 3



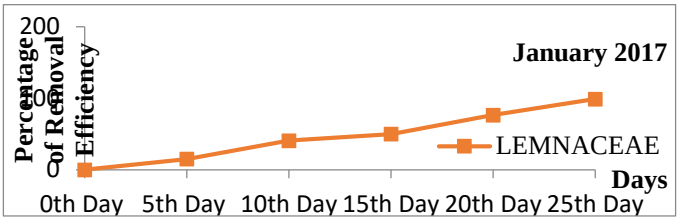
Removal Efficiency of Copper Metal for Sample 4



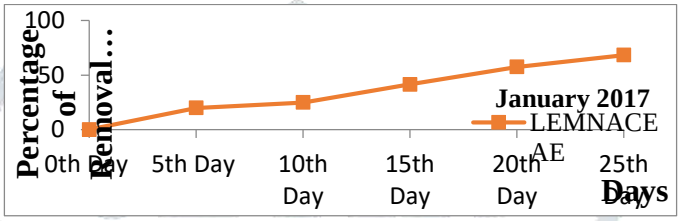
Removal Efficiency of Copper Metal for Sample 5



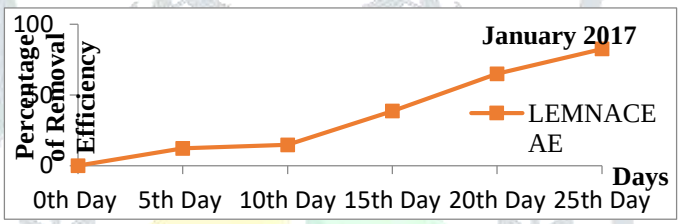
Removal Efficiency of Copper Metal for Sample 6



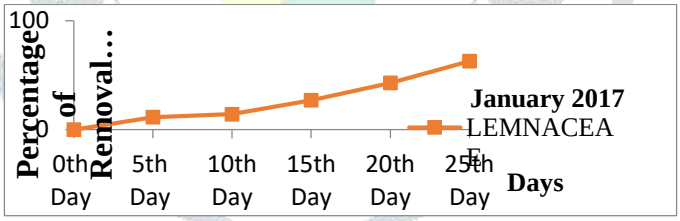
Removal Efficiency of Copper Metal for Sample 7



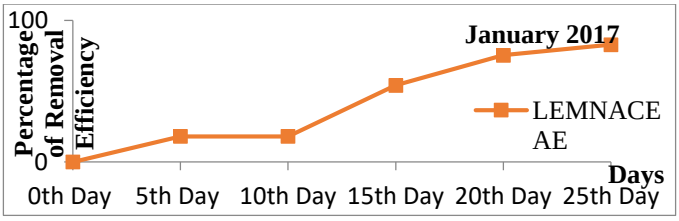
Removal Efficiency of Copper Metal for Sample 8



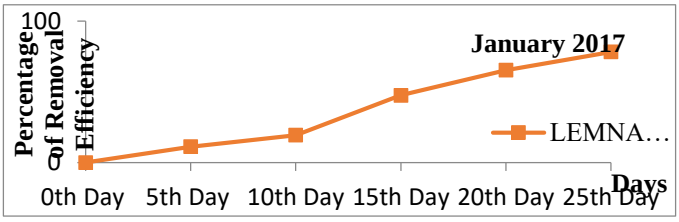
Removal Efficiency of Copper Metal for Sample 9



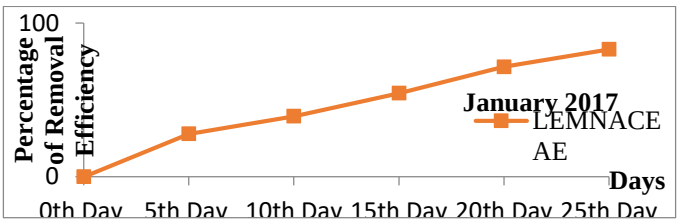
Removal Efficiency of Copper Metal for Sample 10



Removal Efficiency of Copper Metal for Sample 11



Removal Efficiency of Copper Metal for Sample 12



Removal Efficiency of Copper Metal for Sample 13

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

Copper heavy metal can be completely removed in the polluted surface water by growing Lemnaceae aquatic plants simultaneously.

Table:3.3. Copper Metal Removal in the Study area by Phyto-remediation

DURATION	NAME OF HEAVY METAL	100 PERCENT REMOVAL EFFICIENCY OF AQUATIC PLANT	SAMPLE LOCATION
Jan-2017	COPPER	LEMNACEAE 20th Day	1,2,3,4,5,6,7,8,9,10,11,12,13

3.4.Conclusions

- The heavy metal can be completely removed in the polluted surface water by growing Lemnaceae aquatic plant.
- The efficiency of removing copper from the Lennoaceae aquatic plant solution during the 20 days was 100%
- The left-over biomass of all these aquatic plants can be used for vermi composting and to increase the yield of fish in aquaculture

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Aquatic plants, Heavy metals, Phytoremediation, Surface water samples.