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Parul Sharma and Sonali Pandey

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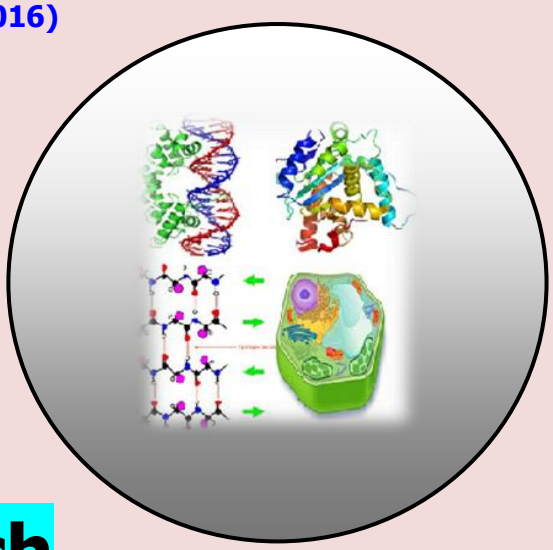

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Ms. Parul Sharma
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RESEARCH PAPER

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Empirical Determination of Heavy Metal (Pb, Cr) by Sewan Grass (*Lasiurus scindicus)* in Waste Soil of Amanishah Nallah Jaipur(*In-Situ* and In- Field)

Parul Sharma and Sonali Pandey
Department of Botany, JECRC University, Jaipur, Rajasthan, India

ABSTRACT

The potentiality of Lasiurus scindicus for phytoremediation of heavy metal (Lead & Chromium) from waste soil of Amanishah Nallah Sitapura Jaipur (In-situ and In- field) was investigated. This plant was grown in In-situ and In- field in polluted soil over 105 days trial period. Accumulation of the heavy metal was studied after 45, 65, 85 and 105 days in leaves and roots by AAS. It was observed that high accumulation level of Chromium in root after 45 and 65 days and absorption of lead is also good amount in root. The results conclude that the Lasiurus scindicus has phytoremediation potentiality and could be used in restoring soil polluted with Chromium and Lead.
Key words: Accumulation, Phytoremediation, AAS and Heavy metal.

INTRODUCTION

Soil and water pollution has recently been most attracting concern for public attention since the magnitude of the problem in our soils calls for immediate action. As a result of human activities such as mining and smelting of metalliferous, electroplating, energy and fuel production, fertilizers and pesticide application, etc., now a days metal pollution has become one of the biggest serious problem of environment. The use of green plants for remediation of soils and waters polluted with heavy metals, has gained good acceptance in the last two decades as a very cost effective method (Mojiri, 2012). This approach is emerging as great innovative experimental tool with huge potential that is most useful when pollutants are within the root zone of the plants. Phytoremediation is energy efficient, cost-effective, aesthetically pleasing technique of remediation sites with low to moderate levels of contamination. A rising method for polluted area remediation is phytoextraction (Ok and Kim, 2007). Phytoextraction is the uptake of pollutants by plant roots and translocation within the plants. Pollutants are generally removed by harvesting the plants, and it has been recognized as an appropriated approach to remove pollutants from soil, sediment and sludge (Singh et al., 2011). Plants may play a vital role in metal removal through absorption, cation exchange, filtration, and chemical changes through the root.(2) Phytoremediation is a fast developing field, since last ten years lot of field application were initiated all over the world, it includes

Phytoremediation of Organic, Inorganic and Radionuclide‟s. This sustainable and low cost effective process is fast emerging as an alternative to conventional remediation methods, and will be most suitable for a developing country like India. Most of the studies have been done in developed countries and knowledge of suitable plants is particularly limited in India. Heavy metals in roadside soils may come from various human activities, such as industrial and energy production, construction, vehicle exhaust, waste disposal, as well as coal and fuel combustion (Li et al., 2001; Bai et al., 2008). A large number of sites worldwide are contaminated by heavy metals as a result of various human activities. Heavy metals pollution of soil requires effective and cost effective remediation technologies. The aim of the study to investigate in situ phytoremediation of heavy metal (Chromium, Lead) from industrial waste Amanisah nallah Jaipur by *Lasiurus scindicus* (sewan grass).In this research experiment was conducted in two sites 1. In fields where farmers uses waste water for irrigation in Sitapura industrial area, Jaipur and 2. In-situ where the waste water coming from directly various industries, hospitals effluents.

MATERIALS AND METHODS

Sampling Site Description

Jaipur (Longitude: 950 24’ E; latitude: 27018’ N) is a city located in the central part of the Rajasthan is undergoing rapid urbanization and industrialization. Almost in all parts of Jaipur city and adjacent areas, a large number of industries have come up during last two decades. Such area includes Vishwakarma, Sudershanpura, Bais Godown, Jhotwara, Malviya, Sanganer, Sitapura industrial areas, etc., which play a major role in polluting different water resources. Sitapura industrial area was selected for the sampling of research work (Fig 1).

Figure 1. Amanishah nallah industrial area waste water effluents Jaipur (experiment area on site).

(A) **(B)**

Figure 2. Experimental set up (A) In Field, (B) *In- Situ.*

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The experiment was carried out 105 days for in-situ remediation. Experiment was conducted in two sites- 1. In situ (in field (Sitapura industrial area) jaipur) (Fig 2) 2. On site (near by Amanishah nallah (Sitapura industrial area)) (Fig 2).

The composition of contaminated soil pH was 9.1-9.5 and nutritional substances included: Potassium - 178-190 mg g−1, phosphate - 18-22 mg g−1, Cu 0.26-0.12 ppm, Mn 5.23-3.22 ppm, Fe- 4.55-2.19 ppm. The composition of contaminated water pH was 7.17- 7.76, Na-13.04-14.78 meq L−1, Ca- 5.80-6.00 meq L−1, Mg-5.82-6.16. Since humidity is the main factor in the growth of plants and the necessary physiological processes, grass plants were watered every 3 days. The experiment lasted 105 days. Firstly uprooted in 45days than every after 20 days were rooted, *Lasiurus scindicus* prepared for analysis and then analyzed. The material was mineralised in the MNIT institute Jaipur; the AAS analysis was carried out at the Department of Material and Research science. Heavy metal lead was identified by a using atomic absorption spectrometer in a flame mode. Plants were separated into root and leaves and were oven dried at 110C. Soil samples were also oven dried at 110C. 2 gram of each sample were acid digested using HCL and HNO3 (10:3). The samples were kept on a hot plate. After removing from hot plate the solution was cooled and the sample was filtered using Whatman 42 filter paper in 100 mL cylinder up to 50 mL so that 50 mL of each sample was prepared. Water samples were directly subjected to analysis. For the presence of heavy metals in soil and water were tested in MNIT institute Jaipur, presented in table.

RESULTS AND DISCUSSION

Lasiurus scindicus (Sewan grass) species were selected for the present study. *Lasiurus scindicus* is a perennial grass that can live up to 20 years. It is a bushy, multi-branched desert grass with ascending to erect wiry stems, height up to 1-1.6 m. Leaves are alternate with a thin leaf-blade. The inflorescence is a silky, 10 cm long bearing hairy spikelets. Fruit is a caryopsis. *Lasiurus scindicus* is the most common grass in north India. Sewan grass is popular in dry areas of North Africa, Sudan and Sahelian regions, East Africa and Asia. It is majorly growing in the Rajasthan desert area. It is very rich in protein, so use this species use as a fodder. Optimal growth conditions are annual rainfall below 250 mm on alluvial or light sandy soils with a pH of 8.5. It is highly tolerable of drought, but should be protected from wind in the early stages of plant.

(A) **(B)**

Fig 3. After 105 days (A) In field (B) *In-situ.*

This species is grown in the area adjoining the industries where industrial effluents contaminated with heavy metals is coming to the field so that the present research is undertaken to study the phytotoxic effects of lead on growth parameters and its phytoremediation through *Lasiurus scindicus* grass.

In the present study the results of phytoremediation experiments (where *Lasiurus scindicus* seeds are showing in industrial polluted) indicate a significant recovery of phytotoxicity induced by lead and chromium insignificant level. AAS studies also confirm that lead and chromium has been absorbed by *Lasiurus scindicus* where the accumulation is more for chromium is primarily in roots as compared to leaves and this makes useful *Lasiurus scindicus* for phytostabilization significant that both metals is accumulated more roots and is low translocated through the vascular system (Table 2 to 5). Thus *Lasiurus scindicus* shows as a good phytoremediator plant for lead and chromium that makes the soil less toxic.

Table 1. Analysis of heavy metals sample (soil) before sowing of seeds.

		In Field	In - situ
S. No.	Heavy metals	Soil	Soil
1	Pb (ppm)	0.955	0.982
2	Cr (ppm)	1.525	2.821

Table 2. Analysis of heavy metals in plant (root and leaf) samples after 45 days.

		In Field		*In - situ*	
S. No.	Heavy metals	Root (metals conc.)	Leaf (Metal Conc.)	Root (metals conc.)	Leaf (Metal Conc.)
1	Pb (ppm)	0.525	0.329	0.325	0.203
2	Cr (ppm)	0.998	0.304	1.89	0.763

Table 3. Analysis of heavy metals in plant (root and leaf) samples after 65 days.

		In Field		*In - situ*	
S. No.	Heavy metals	Root (metals conc.)	Leaf (Metal Conc.)	Root (metals conc.)	Leaf (Metal Conc.)
1	Pb (ppm)	0.795	0.525	0.372	0.225
2	Cr (ppm)	1.233	0.514	1.932	0.872

Table 4. Analysis of heavy metals in plant (root and leaf) samples after 85 days.

		In Field		In - situ	
S. No.	Heavy metals	Root (metals conc.)	Leaf (Metal Conc.)	Root (metals conc.)	Leaf (Metal Conc.)
1	Pb (ppm)	0.779	0.529	0.375	0.229
2	Cr (ppm)	1.239	0.530	1.992	0.881

Table 5. Analysis of heavy metals in plant (root and leaf) samples after 105 days.

		In Field		In - situ	
S. No.	Heavy metals	Root (metals conc.)	Leaf (Metal Conc.)	Root (metals conc.)	Leaf (Metal Conc.)
1	Pb (ppm)	0.801	0.532	0.379	0.231
2	Cr (ppm)	1.241	0.534	1.998	0.887

CONCLUSION

Present study was to estimate that accumulation of Chromium is more than lead in root of *Lasiurus scindicus*. After 105 days results showed that accumulation of chromium is good in *In-situ* experiment.

So *Lasiurus scindicus* can be used as good phytoremediator of chromium and lead which confirm the potentiality of stabilized of Lead and chromium in root. This research showed that farmers can be use *Lasiurus scindicus* as a remediator plant in fields.

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Corresponding author: Ms. Parul Sharma, Department of Botany, JECRC University, Jaipur, Rajasthan, India

Email: sharmaparul222@gmail.com

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