

REVIEW ARTICLE

A brief review of original researches on phytoremediation property of *Cyperus rotundus* Linn. on Lead (Pb)

Sailakshmi V J, Raiby P Paul, Priya S, Vimala K S, Priyalatha B

Department of Dravyagunavijnana (Ayurvedic pharmacology), Amrita school of Ayurveda, Amritapuri, Amrita Vishwa Vidyapeetham, India.

ABSTRACT

The aim of the present paper is to review all the published original articles related to phytoremediation property of *Cyperus rotundus* Linn. on lead (Pb). The databases like PubMed, Current science and Google scholar were searched with appropriate keywords. A total of 947 articles were obtained which reduced to 12 after advanced search option was applied. Finally, 9 articles were found relevant to the topic and were selected for the review. The important points like area from where the samples were collected, part of the plant taken for heavy metal analysis, instrument(s) used, amount of lead, Bioconcentration Factor (BCF) and Translocation Factor (TF) were noted and interpretation has been made. Analyzing these 9 studies, the samples were collected from different areas and the maximum lead contamination of the plant was sourced from mining area. From these studies, it could be understood that the amount of lead concentration in the root is much more than the shoot, leaves and the flowers. Quantity of lead, BCF and TF values of *Cyperus rotundus* were significantly high but are yet to be substantiated with more research studies.
Keywords: *Cyperus rotundus*, Phytoremediation, Lead

Received 09.04.2019 Accepted 28.05.2019

© 2019 AELS, INDIA

INTRODUCTION

Contamination of soil and water by heavy metals is a burning issue owing to the hazards it causes on the plants and humans. Among the heavy metals, Lead (Pb) is a potent pollutant that readily infiltrates into the soil and easily get absorbed by different plant parts. Overtime the accumulation of lead in plants will reduce the crop productivity and causes threat to the agriculture field. Its accumulation in human body causes damage to Central Nervous System. There are about 400 plant species that has got affinity towards heavy metals. These plants are considered as suitable for Phyto-stabilization and phytoextraction. *Cyperus rotundus*, being a weed growing in waste lands has a high affinity for lead absorption [1-3]. The usage of *Cyperus rotundus* for phytoremediation of heavy metals including Pb has researched and published. This article reviews all the published original articles related to the phytoremediation property of *Cyperus rotundus* on lead.

MATERIALS AND METHODS

Literary search has been carried out with suitable keywords to find out the articles related to phytoremediation property of *Cyperus rotundus* on lead. Databases like PubMed, Current Science and Google scholar were searched. The keywords used were phytoremediation, *Cyperus rotundus* and a combination of phytoremediation, lead contamination, lead accumulation and *Cyperus rotundus*. Boolean operators and advanced search options were used for filtering the search. 3 articles were obtained from PubMed in which only 1 was relevant to the topic. No article related to the area of interest was found in Current science and about 946 articles were obtained from Google scholar. Out of the 947 articles, only 12 relevant papers were obtained. Out of the 12, 3 had to be excluded since full article was not available. The data obtained from the remaining 9 papers were analyzed and tabulated in Table No.1.

RESULTS AND DISCUSSION

Total nine original articles were obtained related to lead (Pb) and *Cyperus rotundus*. Out of them, two studies were conducted in India, others were in Pakistan, Egypt, Malaysia, Philippines, Saudi Arabia, Nigeria and Vietnam. In eight of them, samples were collected from heavy metal polluted area. And in the

other study, samples were procured from different ecological zones. While analyzing the methodology followed in each study, in 5 studies lead content was analyzed using different types of Atomic Absorption Spectrometry. Rest of the works were done using Inductively Coupled Plasma Emission Spectrometry, Inductively Coupled Plasma Optical Emission Spectrometry, Inductively Coupled Plasma Mass Spectrometry and Inductively Coupled Plasma Atomic Emission Spectrometry. All the studies were focused on the amount of lead accumulated either into the roots or shoots or both root and shoot except two studies, in which one was on the lead content in the leaves and one in the root, shoot, leaves and flower of *Cyperus rotundus* separately. In six studies, the Bio Concentration Factor (BCF) and in two, the Translocation Factor (TF) were analyzed.

Table No. 1; Details about the researches done on phytoremediation property of *Cyperus rotundus* Linn. on Lead (Pb)

No.	Country	Area selected	Part of the plant	Instrument (s) used	Amount of Lead (mg/kg)	BCF	TF
1	India		Root	AAS	28.36	2.99	-
2	Philippines	Military firing site	Root & shoot	AAS	Root - 534.40 Shoot - 112.20	0.195	-
3	India	Different ecological zones	Root	ICP-ES	18.47± 1.36	-	-
4	Nigeria	Metalliferous mining site	Root& shoot	AAS	Root - 39.90 Shoot - 34.10	1.71	0.85
5	Egypt		Shoot	Flame AAS	331± 14.56	-	-
6	Pakistan	Industrial zone	Root& shoot	Fast Sequential AAS	Root - 33 Shoot - 20	2.5	-
7	Malaysia	Mining site	Root, shoot, leaves & flower	ICP-OES	Root - 440.13 Shoot - 151.19 Leaves - 188.76 Flower - 142.16	0.3599	1.094
8	Vietnam	Mining site	Root & shoot	ICP-MS	Root - 1560.1 Shoot - 941.3	0.25	-
9	Saudi Arabia	Waste water irrigated area	Leaves	ICP-AES	132.75	-	-

CONCLUSION

Phytoremediation property of *Cyperus rotundus* on lead was well studied by experiments carried out in different countries around the world. Out of the different areas from which the samples were collected, mining area is found to be the main source of lead contamination. Among the different methodologies or instruments used, Inductively Coupled Plasma Spectrometry is more precise and advanced technique than Atomic Absorption Spectrometry. Accumulation of Pb is comparatively more in root than the aerial parts. The values of Pb in samples sourced from the mining area were alarmingly higher than safe and permissible limit (Permissible limit of Pb in plants according to WHO is 10 mg/kg). Out of the 9 articles reviewed, one paper states *Cyperus rotundus* to have the capacity of hyper accumulation of Pb. In this study value of lead was 1560.1 mg/kg (Refer table; study no.8) which indicates the hyper accumulating property of the plant on lead. The BCF was recorded in 3 papers as 2.99, 2.5, 1.71 (study no.1, study no. 6, study no. 4) which are indicative of ability of the plant to absorb the Pb from the soil.

REFERENCES

1. <http://www.ncbi.nlm.nih.gov/m/pubmed/>
2. www.currentscience.ac.in
3. <http://scholar.google.com>

CITE THIS ARTICLE

Sailakshmi V J, Raiby P Paul, Priya S, Vimala K S, Priyalatha B. A brief review of original researches on phytoremediation property of *Cyperus rotundus* Linn. on Lead (Pb). Res. J. Chem. Env. Sci. Vol 7 [3] June 2019. 67-68