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RESEARCH ARTICLE

DISTRIBUTION ABUNDANCE AND TRACE METALS IN THE MACROFLORA OF AN AQUATIC SYSTEM

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ABSTRACT

Trace metals like Copper, Zinc, Cadmium, Chromium and lead in the macroflora associated with a deserted pond were analysed seasonally and annually. The results indicated that the macrophytes such as *Jussieua repens* L. and *Limnocharis flava* L. accumulated the trace metals in a seasonal pattern with Cu >Zn > Cd > Cr > Pb. The concentration factors revealed a high accumulation efficiency of these plants which could be exploited in waste water treatment

INTRODUCTION

Trace metals have become ubiquitous in the environment due to rapid industrialization and urbanization. Their increased concentration has contaminated the components of the environment and biosphere. Trace elements, both essential and non essential are brought to the soil and water from various sources from where they enter into living system and pass on to higher trophic levels. But they play a vital role in the growth and development of plants. Many act as cofactors of enzymes and help in the formation of intermediate metabolites. Plants are able to accumulate metals from the surroundings. Metal uptake in relation to the external concentration may differ in different genotypes of plants (Greger, 2004). The amount of trace metals in plants depends on many factors especially their concentration and availability in the medium, physicochemical properties of the medium, climatic conditions and the extend of accumulation by different species which have been extensively studied (Griffith,1980; Martin *et al*., 1980; Soon, 1982; Bunzl 1983; Cary1983;Chakrabarti *et al*., 1993; Thomas and Fernandez,1997; Keller *et al*., 1998; Sanchez *et al*., 1998; Veeresh *et al*., 1998; Oliveira *et al*., 1999; Vajpayee *et al*., 1999; Zhu *et al*.,1999; Prasannakumari *et al*., 2012).

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The present study is an attempt to elucidate the seasonwise distribution pattern of different trace metals like copper, zinc, cadmium, chromium, and lead and the computation of concentration factors for each metal in the macroflora collected from a deserted pond. The metals were selected based on their significance to biological systems as well as their interference with the environment resulting in the creation of manifold facets of pollution.

MATERIALS AND METHODS

The Macroflora *Jussieua repens* L and *Limnocharis flava* L were collected from a pond in Thiruvananthapuram District, Kerala. This aquatic system was an uncared one filled with enormous quantity of mud, sand and waste and imparts the appearance of a transition to terrestrial environment. The collected plants were thoroughly washed and dried and powdered samples were used for various analyses following standard procedure (APHA, 1992). The analysis of trace metals was done by digesting a known quantity of the samples in a mixture of nitric acid and perchloric acid (4:1v/v) and aspirating the digested samples into Atomic Absorption Spectrophotometer (AAS) PERKIN ELMER MODEL 2380. The values were expressed in $\mu g\ g^{-1}$. The results were subjected to seasonal analysis and concentration factor was calculated by comparing the data with sedimentary metal concentration.

RESULTS AND DISCUSSION

The seasonal data for metals are depicted in Figure 1 and Figure 2. The results obtained in the present study are in unison with other reports on elemental accumulation in other aquatic / riparian flora (Untawale *et al*., 1980; St. Cyr and Campbell, 1994; Munshi *et al*., 1998; Prasad and Freitas, 2000; Rama and Rajeswari, 2001; Prasannakumari *et al*., 2012).The seasonal analysis indicated that both the plants, *Jussieua repens* and *Limnocharis flava* showed a seasonwise accumulation trend postmonsoon< premonsoon < monsoon for copper. *J. repens* followed a similar pattern for cadmium and *L. flava* for lead. A trend with premonsoon < monsoon < postmonsoon was observed for zinc and chromium in *J. repens* and zinc, lead and chromium in *L. flava*. The high values during monsoon / postmonsoon corroborates with the findings of Prasannakumari *et al*. (2012) which could be attributed to the terrigenous run off to the aquatic system bringing enormous quantity of waste material. The metals recorded an order of accumulation Cu > Zn > Cd > Cr > Pb when the annual average was compared (Table 1). The trace metal content in the macrophytes analysed were higher as compared to the standard values (Leeper, 1978).

Table 1. Annual average values (µg g^{-1}) for trace metals in *Jussieua repens* L. and *Limnocharis flava* L.

	Copper	Zinc	Cadmium	Chromium	Lead
L. flava	270.34	158.81	39.96	15.92	10.90
J.repens	339.07	170.46	23.29	13.26	11.10

Table 2. Concentrations factors for trace metals in *Jussieua repens* and *Limnocharis flava*

Metals	*J.repens*	*L.Flava*
Copper	33.47	26.68
Zinc	6.47	6.03
Cadmium	4.17	7.16
Chromium	0.86	1.04
Lead	0.5	0.44

A comparative analysis of the annual concentration factor (Table 2) computed for various metals greater than unity for copper, zinc and cadmium in *J. repens* and for copper, zinc, cadmium and chromium in *L. flava* refelects that the macrophytes are capable of better accumulation of these metals. The study warrants further investigation so that these plants could be exploited for the removal of toxic metals from waste water and also as a pollution indicator.

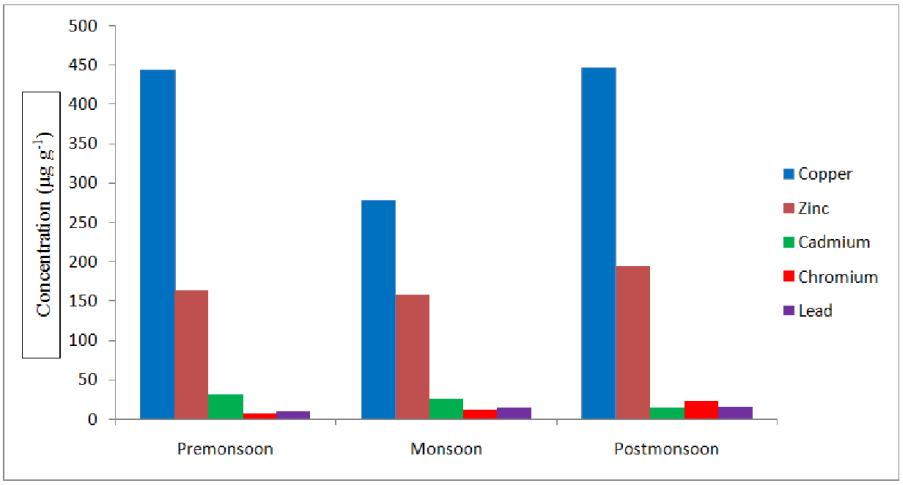

Fig.1. Distribution of different trace metals in *Jussieua repens* L. (µg g^{-1})

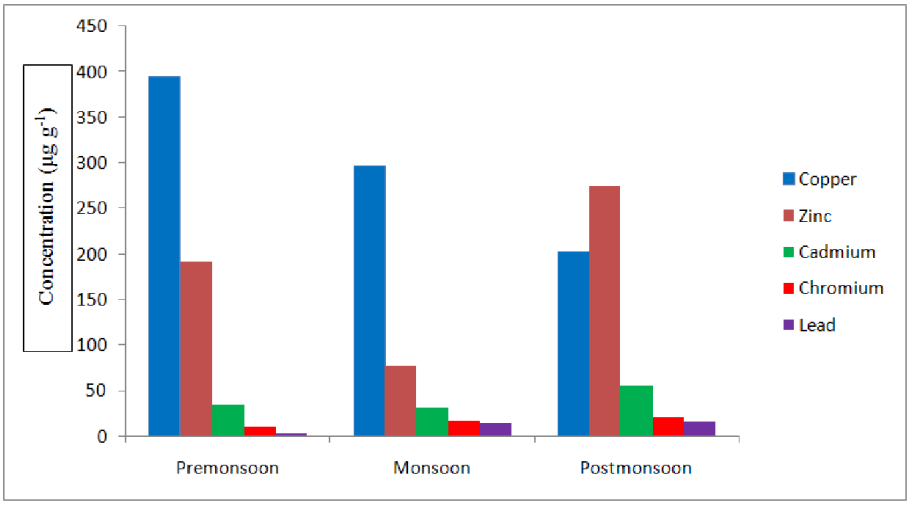

Fig. 2. Distribution of different trace metals in *Limnocharis flava* L. (µg g^{-1})

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