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A PRELIMINARY INVESTIGATION OF THE METAL CONCENTRATION IN DIFFERENT PARTS OF *RHIZOPHORA MUCRONATA* FROM BHIRA VILLAGE, MIANI HOR OF BALOCHISTAN COAST, PAKISTAN

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ABSTRACT

Pakistan has a vast coastal line of 1120 km bordering the northeast Arabian Sea. The mangrove forest in Bhira village, Miani Hor, Balochistan coast, Pakistan is spread over an area of about 2500 hectares which represents 42% of total covered mangrove forest in Balochistan. The study site, Bhira village, Miani Hor is continuously receiving continues amount of heavy metals from effluents and discharge of different rivers and industries and ship breaking yard. The results of analysis showed that concentrations of Fe, Cd and Pb were high in *Rhizophora mucronata* collected from Bhira village, Miani Hor, Balochistan.

Key Word: Heavy metal, Mangrove, Bhira Village, Marine Pollution, Accumulation.

INTRODUCTION

The mangrove plants are large, woody tree with a conspicuously thick, densely interwoven root net work (Pinet, 1992). There are about seventy species of mangroves are found in different areas of the world. *Rhizophora mucronata* (Lam.) is one of the widely distributed mangrove species that is belongs to the family Rhizophoraceae occurs on the coasts of the Indian Ocean and the West-Pacific. Mangroves have an ecological value and they have been used for centuries as source of firewood, construction timber salt, tannins, dyes and food. Due to these many uses, fast growing rate and viviparous seeds mangroves especially *Rhizophora mucronata* have been grown and harvested using standard silviculture practices (Pahalawattaarchchi *et al.*, 2009). The height of *R. mucronata* tree is 20-25 m and decrease gradually to landwards. The mangrove forests development largely depends on warm air temperatures, high annual rainfall and the generation of vast intertidal substrata by coastal geomorphic processes (Thom, 1984). Mangrove habitat receives heavy metals from domestic and industries and show significant metal contamination (Tam and Yao, 1998). The sediments in mangrove areas have a large capacity to retain heavy metals from tidal waters, fresh water rivers, and storm water runoff, and often act as sinks for heavy metals (Lacerda et al., 1993; Harbison, 1986; Tam and Wong, 2000).

In Pakistan the total area covered by mangrove forests is approxinmt167, 500 hectors. The total area covered by mangroves on the coast of Sindh is approximately 160,000 hectares while on the Balochistan coast the area is about 7,500 hectares. Sonmiani is the only place in Pakistan where three species of mangroves, Avicennia marina, *Rhizophora mucronata* and *Ceriops tagal* occur naturally The metals concentration in mangroves plants or mangrove area related to Pakistan is still unknown. From an environmental point of view, bio-concentration is very important because metals are non biodegradable and once they enter the marine environment causing serious hazards effect on marine organisms and still human beings. Therefore the present study is undertaken to know the levels of metals (Cu, Pb and Fe) in mangrove trees found at the Sonmiani (Bhira village), coast of Balochistan and marks a beginning of such studies.

MATERIALS AND METHODS

The study site, Bhira village, Miani Hor is a swampy lagoons situated at 25° 35`N latitude and 66° 20`E longitude on the coast of Lasbella District of Balochistan, Pakistan. The site is located 95 kilometers from Karachi near Sonmiani Bay. It is a 60-km long and 7-km-wide tortuous and contorted body of water, which is connected to the sea by a 4-km-wide mouth. Three parts of mangrove leave, root and stem of *Rhizophora mucronata* were collected randomly from sea to land ward in the month of November 2010 at the site Bhira village, Miani Hor.

All leaves root and stem samples of a mangrove were placed individually in pre-labeled plastic bags and brought to the laboratory where all plants were carefully cleaned with filtered seawater. The samples were dried at 60-70 ^{o}C for 24 hours till a constant weight was achieved. The samples were then homogenized with a porcelain pestle and mortar to a powder form, sieved and stored in plastic bottle until further analysis. Digestion of samples was carried out as described by Denton and Burdon Jones (1986). In digested samples of seaweeds concentrations of

Fe, Cd and Pb and were measured by Atomic Absorption Spectrophotometer (AA-6300). Standard for calibration were prepared in deionized water from 1mg/ml stock standard solution (May and Baker LTD Dagenham England). The values of each reported metal are the mean of three observations expressed in micro gram per gram dry weight (μg g^{-1}).

RESULTS AND DISCUSSION

The data reveals high variability in metals concentration in *R. mucronata* within and between parts of tree. In mangrove tree *Rhizophora mucronata* the concentration of metals were found to vary from 5.07 -11.61 μg g^{-1} for Fe, 0.9-1.31μg g^{-1} for Cd and 0.64-1.15 μg g^{-1} for Pb. The concentration of Fe was higher than the concentration of Cd and Pb. The concentration of Fe was high in stem 11.61 μg g^{-1} and root (10.29 μg g^{-1}) as compared to leaves (5.07 μg g^{-1}) while the concentrations of Cd and Pb were also high in stem (1.31 μg g^{-1} and1.15 μg g^{-1} , respectively) and roots (1.26 μg g^{-1} and 1.02 μg g^{-1} respectively) as compared to leaves (0.9 μg g^{-1} and 0.64 μg g^{-1}, respectively) (Table 1). In all parts of *R. mucronata* the metal distribution patterns in decreasing order was Fe > Cd > Pb. It is also fact that Fe concentration was high in all parts of mangrove tree as compared to Cd and Pb (Table 1). The high concentrations of metals (Fe, Cd and Pb) in the stem and roots than in leaves is due to stem and roots are the hard and strong parts of plant and they play as barrier for metal translocation in leaves i.e., the soft parts. Peter *et al*. (1997) also investigated in their study that number of metals such as Cu, Zn, Pb, Fe, Mn and Cd accumulated predominantly in root tissue as compared to foliage in *Rhizophora* species and other numerous mangrove species such as *Avicennia* and *Kandelia*. The results of Fe concentration (5.07 -11.61 μg g^{-1}) were less in present investigation when compared with the results of Pahalawattaarchchi *et al.* (2009) described for the same species *Rhizophora mucronata* collected from Alibag, India.

Table 1. Heavy metal Concentrations (μg.g-1) in different plant parts of *R. mucronata*.

Plant Parts	Fe	Cd	Pb
Root	10.29 ± 1.2	1.26 ± 0.04	1.02 ± 0.28
Stem	11.61 ± 2.3	1.31 ± 0.06	1.15 0.43
Leaves	5.07 ± 0.45	0.90 ± 0.44	0.64 ± 2.10

The Bhira village, Miani Hor of Balochistan coast faces two threats, namely domestic waste disposal and accumulated solid waste debris. Two seasonal rivers, Porali and Windor also enter in to the Bay. Porali River drains through the Bela region and empties into the central part of the bay where-as the Windor River enters near the mouth of the bay (Rasool *et al*., 2002). The causes for high metal concentration in the mangrove tree may be due to higher terrestrial inputs by rivers, rain fall and weathering of rocks and mineral. The high iron concentration is probably due to several factors, the established need of iron for normal growth of mangrove plants (Alongi, 2010) and ability of plant to biomagnify iron from the surrounding environment. High concentrations of Fe and other studied metals. Cd and Pb, as found in the present investigation may also be due to the discharge of domestic and industrial wastes, harbour activities such as dredging and cargo handling, the dumping of ship waste and other coastal activities of coastal people. the ship breaking yard in Gadani may be another reason. The present results also agree from this statement that mangroves protect the water quality and reduce the pollution of coastal areas.

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