Estimation of Heavy Metal of Molluska Shell, Water and Soil Collected from Darmalak Dam, Tehsil Lachi District Kohat

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Abstract: This study was aimed to analyze six heavy metals such as Cu, Zn, Mn, Pb, Cd, Cr and estimated in sediments, shells, tissues of three gastropod Viz Rapanarapiformis, Chicoreus virgineus and Hemifusus pugilinus, using AAS. We ensure that the heavy metals found in sediment are high concentration in this study area followed by tissue and shell of gastropod. The homogeneity, samples Cr not present. But tissue samples having the diverge the concentration as well as order. The high concentration of heavy metals found in the sediment is due to the anthropogenic inputs and fishing activity. This study conclude that even though the accumulation of heavy metals found in the samples are in low concentration, we should take some measurements to save our marine system in the form of reducing the pollution loads into the marine environments.

Key words: Gastropod • Heavy Metals • Pondicherry • Rapanarapiformis

INTRODUCTION

The raising in the heavy metals concentrations can harmful on soil and could be the ecological and human when enter to the food chain [1] which are taken by the plants or animals and so transferred to higher levels of the food chain [2, 3]. To quantify the risk of trace metal consumption by higher organisms therefore the study of the behavior of trace metals in food chains is essential. Studies the various land snail species (Gastropoda, Pulmonata) have become popular because they accumulate high concentrations of certain trace metals via oral, dermal and respiratory routes of exposure [4, 5]. Therefore they are considered as appropriates of metal pollution because the trace metals tend to accumulate in their digestive land [6-8]. In the present study we used such a multidisciplinary microcosm approach to testifsoil physicochemical properties, as well as soil and nettle (Urticadioica) metal concentrations, affect trace metal accumulation in the digestive gland of the snail Cepaeanemoralis determine if metal concentrations in the digestive gland of snails affect biomarker responses investigate the effect of exposure time, site and metal type on metal accumulation and biomarker response in snails. In aquatic ecosystems the presence of heavy metals is originated from natural interactions between atmosphere, sediments and water [9-11]. The wide spread deterioration of aquatic ecosystems is mainly caused by water pollution. The trace metals can be harmful to a wide range of aquatic species, non-biodegradable, can be lethal above a certain threshold and are persistent, that’s why the heavy metals are very important [12] and can also induce the sub lethal effects in organism by exposing to metals including damage at the cellular and molecular levels as well as disruption of homeostasis [13] which may significantly reduce the survival capacity of the organism by increasing susceptibility to diseases and damage [14].

In such contaminated environments Sessile filter-feeding organisms will often reflect environmental degradation, both in terms of the arability through the
impacts of such exposure on key biological processes and to accumulate toxicants in their tissues [15]. Which play a very important role in the environment call as bioindicator. These bioindicator organisms perform an important role by monitoring for environmental health and indeed taxa such as bivalves have been used in this manner [16].

Mussels (Bivalve species) are able to tolerate fluctuations in temperature, oxygen levels and salinity and the seat tributes, along with their sessile nature, annual availability and general abundance make them favorable as a bioindicator [17]. Beside it the mussels accumulate trace metals in proportion to the availability of metals in the environment as shown from different laboratory and experimental studies [18] This ability has been used in the Mussel Watchpro-gramme [19] and to assess the biological impacts of contaminants, but until recently the Mussel have also been used [20].

Lachi is one of two Tehsil in the Kohat District of Khyber Pakhtunkhwa province in Pakistan having Total area, 1,161 km² (448 sq mi). Darmalak dam is located in Darmalak, which is a populated place located in Tehsil Lachi, Kohat KPK, Pakistan. The estimated elevation above sea level is 531 meters having Longitude: 71°15′14.97″ and Latitude 33°24′52.6″ Darmalak is a small dam located on Maryam ZaiTui, 15 miles south of Kohat, 1 KM West of Darmalak Village (Geographical coordinates are 33°23′37″N 71°13′36″E), KPK, Pakistan.

The purpose of dam construction was to control flood, to provide better irrigation and last but not the least for cultivation of fishes [21]. And having seven identified fish species, Ctenopharyngodon idella, Labeo rohita, Ompokpabada, Anguilla Anguilla, Catla catla Lepidocephalus guntea and Cirrhinus mirgala are surviving in Darmalak Dam [22]. In this dam as the fish fauna are the snails too, through which the trace metals can be reached to the fish surviving in the mentioned dam by trace metal contaminated soil and water and then may have bad effect on the food chain and environment. Therefore the present study was conducted for assessing the trace metals in snails, soil and water of Darmalak. The present study will provide useful information for monitoring the changes in the water and soil quality with respect to heavy metals.

**MATERIALS AND METHODS**

**Study Area:** The present study is performed on Darmalak dam located on Maryam ZaiTui, 15 miles south of Kohat, 1 km West of Darmalak Village (Geographical coordinates are 33°23′37″N 71°13′36″E), KPK, Pakistan [22].

**Sampling:** Fresh Mollusca shells were collected from different locations at Darmalak dam in properly washed plastics vessels, while soils were collected nearer the bottom of dam and then placed in air tight polyethylene bags for further analysis by using the methodology followed Majeed et al. [22].

**Determination of Heavy Metals Concentrations:** The samples were rinsed thoroughly with sterile distilled water. These the snails were identified at department of Zoology, Kohat University of Science and Technology, Kohat. The samples were immediately kept in pre cleaned polythene bags after identification. The portions of shell from 4-5 specimens of uniform size (4-5mm long) were pooled together and dried at 70 °C to constant weight.

Similarly the sediment samples were also dried and were passed through a 2mm mesh. The mortar and pestle was used for the grinding of the snail shells and both the sediments and shells in the powder form were kept in desiccator prior to further analysis.

Five replicate samples of sediment and snail shells samples were weighed accurately and taken 0.5g in to 100 ml beaker and digested with 5ml of H₂O₂ (30%) and 5 ml of conc. HNO₃. Until the initial vigorous reaction subsided, the beaker were covered with a watch glass and left aside followed by heating the samples on hot plates to reduce the volume up to 3-4ml, for about two hours. Then the digested samples were allowed to cool. After cooling samples were filtered and make up to 25ml in volumetric flask with deionized water (Majeed et al.).

**Data Analysis:** Statistical analysis of mean and standard deviation also intended and the correlation Analysis of covariance (ANOVA) was performed between the species.

**RESULTS AND DISCUSSION**

Fish are motivated to the areas that are physiologically best by their physicochemical environment.

In Table 1, the ratio of heavy metals in water was fewer amounts as compare to soil. Ni and Cu were not detected in water but in soil only Cu was not detected.

<table>
<thead>
<tr>
<th>Heavy metals</th>
<th>Water (µg/g)</th>
<th>Soil (µg/g)</th>
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<tbody>
<tr>
<td>Pb</td>
<td>0.003 ±0.171</td>
<td>1.551 ±0.249</td>
</tr>
<tr>
<td>Cd</td>
<td>0.054 ±0.043</td>
<td>0.122 ±0.011</td>
</tr>
<tr>
<td>Zn</td>
<td>0.418 ±0.021</td>
<td>1.522 ±0.026</td>
</tr>
<tr>
<td>Ni</td>
<td>nd</td>
<td>0.226 ±0.006</td>
</tr>
<tr>
<td>Cr</td>
<td>18.16 ±4.087</td>
<td>33.07 ±11.37</td>
</tr>
<tr>
<td>Cu</td>
<td>nd</td>
<td>nd</td>
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</tbody>
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nd: not detected
Zn>Pb>Fe>Ni>Cd
Heavy metal variation in snails.

In soil the order of heavy metals were Cr>Pb> Zn> Ni> Cd while in water Cr>Cd>Zn>Pb. The concentration of Cr was very high 33.07 ±11.37 µg/g in soil and 18.16 ±4.087 µg/g in water followed by Pb, Zn, Ni and Cd, 1.551 ±0.249, 1.522 ±0.026, 0.226 ±0.006 and 0.122 ±0.011 respectively.

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nd: not detected
In soil. In water the concentrations of these heavy metals were very less as compared to soil. The highest concentration was observed of Cr, 18.16 ± 4.087 followed by Cd, 0.054 ± 0.043, Zn, 0.418 ± 0.021 and Pb, 0.003 ± 0.171. The current study indicated that heavy metals can transmit from soil to water due to water channels and other snail species. The snails have soft tissues and very active to transmit the heavy metals to the ecological food chains of the human being by eating the fish located in the same areas. As different species of fish are found in the study area, Darmalak Dam and the people capture these fish for food purposes. The heavy metals can be transmitting through this ways. Based on this event the present study was conducted. The highest concentration of heavy metals was observed in the soft tissues of snail species in the study area which were Zn and Pb and the heavy metals ion concentration order was Zn > Pb > Fe > Cd which was similar order to the study conducted in South East Coast of India. While the sediment metal concentrations were more contaminated than their counter parts, result also verify this observations, which are known to cause toxic effects in benthic animals and the high concentration of heavy metals present in the sediment is due to the anthropogenic inputs.

CONCLUSION

The levels of heavy metal concentrations (Cu, Ni, Mn, Co, Cd and Pb) are within the allowed levels (FAO, FDA and BFL). These values were higher than those reported in previous studies, which suggests an alarm signal because of the entry of pollutants within its bioavailability as commercially significant organisms. The highest concentration of total heavy metals in the studied organisms was found during the drought period. The obtained results show that only significant variations between size and copper and manganese metals were observed during the drought period.

REFERENCES


