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Studies on Relationship Between Season and Inorganic Elements of River Soan at Dhoak Pathan Bridge (Chakwal), Pakistan

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Abstract: The present study was designed to demonstrate the seasonal variations in inorganic elements of River Soan at Dhoak Pathan Bridge, for a period of eight months from May 2001 to December 2001. Water samples were collected on monthly basis and different metals were detected through atomic Absorption Spectroscopy. The levels of Zn and Mg concentrations were below the detection limit. Na concentration was maximum in May (168.75 ppm) and minimum in July (22.5 ppm). K concentration was maximum in December (12.31 ppm) and minimum (3.94 ppm) in August. Ca concentration was maximum in May (34.25 ppm) and minimum in October (4.25 ppm). Maximum variation was observed in case of Sr. Sr was not detected in May and July while maximum (0.47 ppm) Sr was detected in November and minimum (0.04 ppm) in June. The overall levels of inorganic elemental concentrations were within the safe limits at the sampling site throughout the study period.

Key words: Relationship, season, inorganic elements, river soan

INTRODUCTION

Heavy metals are the part of environment, but human activities contribute significantly to total environmental exposure to these substances. The concentration of heavy metals in surface water depends on several factors: airborne contribution from long-range transport; local point sources; natural presence in bedrock and soils and airborne contribution from soil dust (Frank and cross, 1974). In addition, conditions in the catchments and in the lake are important for the mobility and availability of heavy metals in the water. As rivers and lakes are exposed to atmospheric depositions of anthropogenic ally derived trace elements, such elements can create harmful effects on environmental and human health due to their toxicity and their bioaccumulation in various environmental compartments (Leonard, 1971; Boyd and Tucker, 1998).

During recent years the role and importance of fish towards studying the problems of populations of aquatic environment due to heavy metals have been actively considered. Fish may clearly reflect the status of water quality, as they are located at the end of aquatic food chain and may act as indicator of water pollution in term of these metals. Thus heavy metal contamination and retention of metal by the fish may be monitored through fish analysis, so that health risks for the consumer may be avoided (Ansari *et al*., 2000; Salam *et al*., 2002).

The objective of the present study was to look into the concentration of inorganic elements in the river Soan at Dhoak Pathan Bridge and the effect of monthly variations on it.

MATERIALS AND METHODS

The present study was conducted at River Soan at Dhoak Pathan Bridge nearly 25 km away from Talagang (district Chakwal). The sampling started from 21st May 2001 and continued up to 22nd December 2001. The study period was consisted of 8 months. The samples were taken from the subsurface in plastic bottles of 1.5 liter capacity on monthly basis.

Atomic Absorption Spectrophotometer and absorbance measurements and computation were made following Chaudhary *et al*. (1999), Ansari and Iqbal (1993) and Salam *et al*. (2000).

RESULTS

The synopsis of the elemental concentration is given in Table 1. 'Zn' and 'Mg' concentrations were very low in all the water samples and were below the detection limit.

The maximum 'Na' concentration (168.75 ppm) was observed in May and minimum (22.5 ppm) in July. 'Na' concentration fluctuated throughout the study period.

The maximum value of 'K' concentration (12.31 ppm) was observed in December and minimum (3.94 ppm) in August. The 'K' concentration remained variable throughout the study period.

Table 1: Relationship between season and inorganic elements of River Soan

Sample #	Months	Date	Zn ppm	Mg ppm	Na ppm	K ppm	Ca ppm	Sr ppm
1	May	21-05-2001	0.0	0.0	168.75	4.69	34.25	0.0
2	June	24-06-2001	0.0	0.0	44.5	4.71	11.25	0.04
3	July	25-06-2001	0.0	0.0	22.5	4.75	4.5	0.34
4	August	26-07-2001	0.0	0.0	44.0	3.94	12.5	0.22
5	September	30-09-2001	0.0	0.0	38.5	8.56	2.75	0.0
6	October	28-10-2001	0.0	0.0	54.5	10.69	4.25	0.37
7	November	26-11-2001	0.0	0.0	51.25	10.81	17.0	0.47
8	December	22-12-2001	0.0	0.0	72.5	12.31	6.25	0.44
Mean			0.0	0.0	62.06	7.56	11.59	0.23
Std. Dev			0.0	0.0	45.38	3.40	10.38	0.19
Range			0.0	0.0	22.5-168.75	3.94-12.31	2.75-34.25	0.0-0.47

The 'Ca' concentration ranged between 4.25 to 34.25 ppm during the study period. The maximum concentration (34.25 ppm) was observed in May and minimum concentration (4.25 ppm) in October.

'Sr' was not detected in May and September but it showed seasonal variation in other months of study period. The maximum 'Sr' concentration (0.47 ppm) was observed in November and minimum (0.04 ppm) in June.

DISCUSSION

Dissolved metallic ions create turbidity and discoloration, can precipitate and form bottom sludges. Limits on individual metals are usually based on toxicity levels. Various metals including those, which are essential micronutrient, are toxic to organisms at their higher concentrations. Normally the free form of the element is potentially toxic to aquatic biota; complexation with organic ligands significantly reduces this concentration and adverse effects. There are other factors such as pH and hardness that effect the concentration of free metal ions and thus regulate toxicity. However, several regulatory agencies have specified limits on total metals to provide a sufficient safeguard against possible synergistic effects. These limiting stream concentrations are generally set at 1.0 gml^{+} of total heavy metals (Frank and Cross, 1974).

It has been observed that Sodium concentration increases in winter season when the river is at lowest flow and decreases in summer season when the river is at its highest flow. Our results showed a similar increase in sodium levels in winter months but maximum value was observed in May. The concentration of sodium ions becomes remarkably high in saline and brakish water. The higher concentration of 'Na' limits the biological diversity due to osmotic stress. If 'Na; contents in the form of chloride and sulphates is very high, it makes the water salty and unfit for human consumption. A high 'Na' content in irregation water brings about puddling of soil. As a result the water intake of soils gets reduced and it becomes hard in which the germination of seeds become difficult (Trivedi and Gurdeep, 1992).

Potassium concentration was maximum in December and minimum in August. 'K' acts in water in the same way as sodium. Although it occurs in small amounts yet it plays an important role in the metabolism of freshwater environments and regarded to be an important macronutrient (Trivedi and Gurdeep, 1992).

'Ca' was maximum in May and minimum in October depending on water level in river. 'Ca' is essential for metabolic processes in all living organisms and as a structural or skeletal material in many. All the vertebrates, mollusks, coral reefs and certain other invertebrates require large quantities of $CaCO_3$ as a major skeletal strengthening material. 'Ca' is present in ions formand as suspended particulates mainly $CaCO_3$. Calcium salts are the main source of hard water (Mearns and Young, 1977). As it is an important contributor to hardness in water, it is able to reduce the utility of water for domestic use (Trivedi and Gurdeep, 1992).

The maximum value of "Sr" was detected in November and minimum in June. "Sr" shows actions in body similar to "Ca". The deficiency of "Sr" can cause decreased growth, osteoporosis, dental caries and bone pain in animals and human beings (Trivedi and Gurdeep, 1992).

The present study concluded that overall levels of the inorganic elemental concentrations were within the safe limit at the sampling site throughout the period of study and water of river is suitable for farming as well as for aquaculture.

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