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RESEARCH ARTICLE

Studies on Hardness and Ion Measurement in River Asan in District Murena

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ABSTRACT

Safe water supply has risen towards the top of the international development community agenda. According to recent United Nation assessment, a global water crises is being caused because of water resources and poor management. Keeping these points in view, the present study is designed to estimate the hardness and ion concentration in water of River Asan in district Morena at specific predetermined sites.

Key words: *Ion Measurement, River Asan, Murena*

INTRODUCTION

Data's indicate that status have been notoriously infection in their water management. The national ministry of environment and forests is well aware of the nexous of problems surrounding lotic habitat. But the lotic aquatic ecosystem, particularly rivers become a conventional conduit for the disposal of broad spectrum of industrial domestic and municipal sewage containing organic and inorganic chemicals. Due to industrial revolution, atmosphere getting polluted by various sources, when the effluent loaded water meets the river, reaction starts taking place and a large part of the effluent is one form or other settles down and adheres or is absorbed by the river sediment. Water is one of the main agents in pedogenesis and is also a very important medium for different ecosystem. Directly or indirectly water is a universal solvent and most biochemical compound in body ionizes, rapidly in water.

The Asan River, no doubt is one of the most important rivers of Madhya Pradesh. It has large drainage basin comprising a big area. Water of Asan River has also been adversely affected qualitatively and quantitatively by all kinds of human activities, specially industrialization and urbanization are the main cause of water pollution. Historical records of M.P. reported that Asan River is a symbol of traditions of tolerance of poise, of challenging the dark forces that undermine unity and integrity that try to subvert ethical traditional value. The socio-economic activities of Asan River have severely damaged the physical and chemical quality of Asan River due to which aquatic flora and fauna going to damage as coliform and faecal coliform grow rapidly. It was since the beginning of 1970's that environmental pollution becomes a serious problem of lentic and lotic habitat in India. The improper disposal of industrial effluent altering the chemical composition of the aquatic habitat in Asan River of Murena district. The major cations imparting hardness are calcium and magnesium.

Hardness is temporary if it is associated mainly with carbonates and bicarbonates and permanent if with sulphate and chloride. Chloride is found in all kinds of water in natural fresh water, however, its concentration remain quite low. The most important source of chloride in natural water is the discharge from sewage.

MATERIALS AND METHODS

HARDNESS:

Hardness was determined by EDTA (APHA-1992). Taken 25 ml. sample in conical flask then add 1 ml. buffer solution followed by 1ml. inhibitor. Then add a pinch of Eriochrome black-T-indicator and titrated against standard 0.01M EDTA till the wine red colour changes to blue.

$$\text{Total Hardness (mg/l) } CaCO_3 = \frac{\text{Titrant used x N x 1000}}{\text{ml. of sample}}$$

Where N = Volume of EDTA used

CALCIUM (EDTA TITRIMETRIC METHOD):

Ethylene diamine tetra acetic acid (APHA, 1992).Taken 25 ml. sample in conical flask then add 1.0 ml. NaOH solution, then add a pinch of murexide indicator and titrated against 0.01 EDTA till the pink colour changes into purple colour.

Calculation:

$$\text{Calcium (mg/l)} = \frac{\text{Titrant used x N x 1000}}{\text{ml. of sample}}$$

Where, N = Volume of EDTA used

MAGNESIUM:

Calcium and Magnesium is a complex of wine red colour with Epicures black-T at pH 10.0. The EDTA has get a stronger affinity for Ca^{++} and Mg++ the former complex is broken down a new complex of blue colour is formed. The value of Mg^{++} can be obtained by subtracting the value of calcium from the total of Ca^{++} and Mg^{++}.The volume of EDTA used in Calcium determination and also in Hardness (Ca^{++}, Mg^{++}) determination with some of the sample as taken in the Calcium determination.

Calculation:

$$\text{Magnesium (mg/l)} = \frac{\text{(Y - X) x 400.8}}{\text{Vol. of sample x 1.645}}$$

Where, X = EDTA used in Calcium determinate for the same volume of the sample
Y = EDTA used in Hardness determination

CHLORIDE (ARGENTOMETRIC METHOD):

Silver nitrate ($AgNO_3$) reacts with chloride to form very slightly soluble white precipitate of AgCl. At the end point when all the chlorides get precipitated. Free silver ions react with chromate to form silver chromate of reddish brown colour. Taken 100 ml. sample in conical flask then add 5 drops of well mixed potassium chromate indicator then titrated against 0.0141N $AgNO_3$ till the first appearance of slightest reddish colour.

Calculation:

$$\text{Chloride (mg/l)} = \frac{\text{Titrant used x N x 35450}}{\text{ml. of sample}}$$

Where N = Normality of Silver nitrate

RESULTS AND DISCUSSION

In the present investigation the values of hardness shows an increase throughout study period. However, this increase has been observed to be non significant from July (2011) to against the probably due to the dilution of Asan River water, resulting on account of rainy season which increase the water level. Further, a significant increase in hardness has been noted from October (2010) to January (2011) may be account for reduced availability of Asan water and mingling of

untreated sewage and industrial wastes in the river. The ground water of Murena that contains high value calcium and magnesium is being used in domestic purposes, is discharged on routine basis in the river water through municipal drains which affect the hardness values of river. Further, high values of hardness could be possible due to human activities including bathing, washing of clothes that incorporates use of detergents powder. The present study reveals that calcium and magnesium values are significantly increased throughout the study period at down stream site 'D' as compared to Up stream site 'A'. The probable reason for his increase is due to the existing calcium and magnesium in the ground water. Various chemical industries that are situated near Asan in Murena city, their effluents are being discharged into the river and river receives million liters of untreated domestic sewage which are also responsible for increase in calcium and magnesium in Asan water. In the present investigation the values of chloride has been observed significantly increased at down stream site 'D' as compared to Up stream site 'A'. However, this significant increase in chloride values is negligible during July (2011). This may probably be due to rainy season. Significant increase in chloride values from October (2010) to January (2011) may be an indication of pollution through domestic sewage. Further, increase of chloride content is perhaps due to the release of industrial, domestic, sewage and other kinds of effluents which are mixed up in the river and are probably responsible for increase in chloride values.

There was significant variation in the total hardness of Water of Asan River at different four sampling stations. However the total hardness of Water of Asan River varies significantly after each three months intervals.

Table 1: Average Hardness

Month	Hardness (mg/l)			
	Site A	Site B	Site C	Site D
Oct-10	83.0	112.0	163.0	117.0
Jan-11	86.0	109.0	172.0	190.0
April-11	90.0	108.0	176.0	178.0
July-11	96.0	100.0	161.0	179.0

There was no significant variation of Calcium in Water of Asan River at different four sampling stations. However, the Calcium of Water of Asan River varies after each three months interval.

Table 2: Average Calcium

Month	Calcium (mg/l)			
	Site A	Site B	Site C	Site D
Oct-10	43.0	45.0	45.0	60.0
Jan-11	47.0	47.0	54.0	63.0
April-11	45.0	49.0	53.0	66.0
July-11	46.0	50.0	52.0	64.0

The datas showed no significant variation in the Magnesium of Water of Asan River at different four sampling stations. However, the Magnesium of Water of Asan River varies significantly after each three months intervals.

Table 3: Average Magnesium

Month	Magnesium			
	Site A	Site B	Site C	Site D
Oct-10	30.0	35.0	39.0	39.0
Jan-11	31.0	36.0	43.0	43.0
April-11	29.0	38.0	38.0	45.0
July-11	35.0	42.0	42.0	46.0

There was no significant variation of Chloride in Water of Asan River at different four sampling station. However, the Chloride of Water of Asan River varies significantly after each three months intervals.

Table 4: Average Chloride

Month	Chloride (mg/l)			
	Site A	Site B	Site C	Site D
Oct-10	47.0	59.0	62.0	69.0
Jan-11	51.0	61.0	68.0	73.0
April-11	58.0	62.6	65.0	70.0
July-11	57.0	71.0	73.0	75.0

Site A= Chanda Gaon, Site B= Jaroni Gaon, Site C= Karua Gaon, Site D= Girgoni Gaon

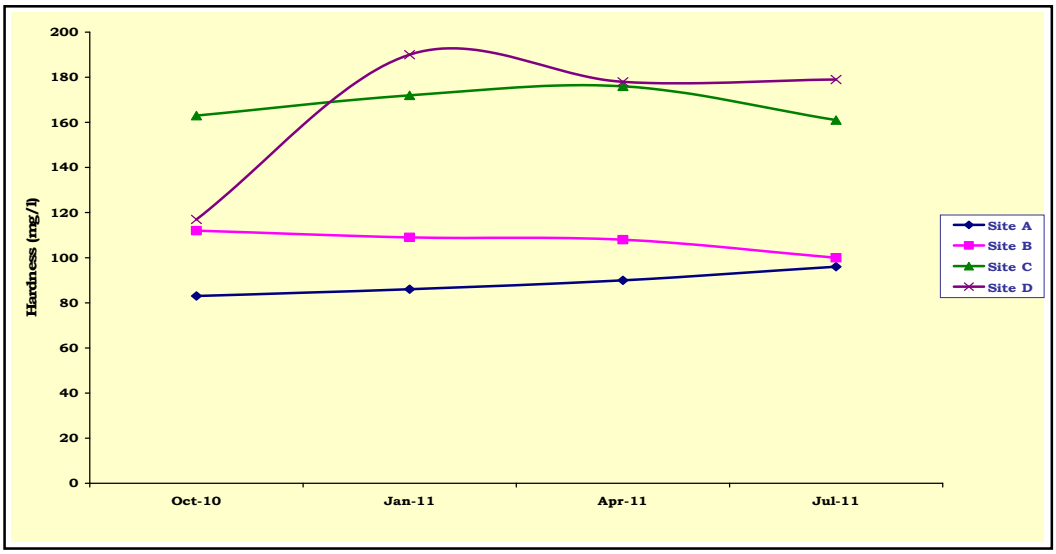

Fig. 1: Hardness in water sample at the four different stations at three months interval

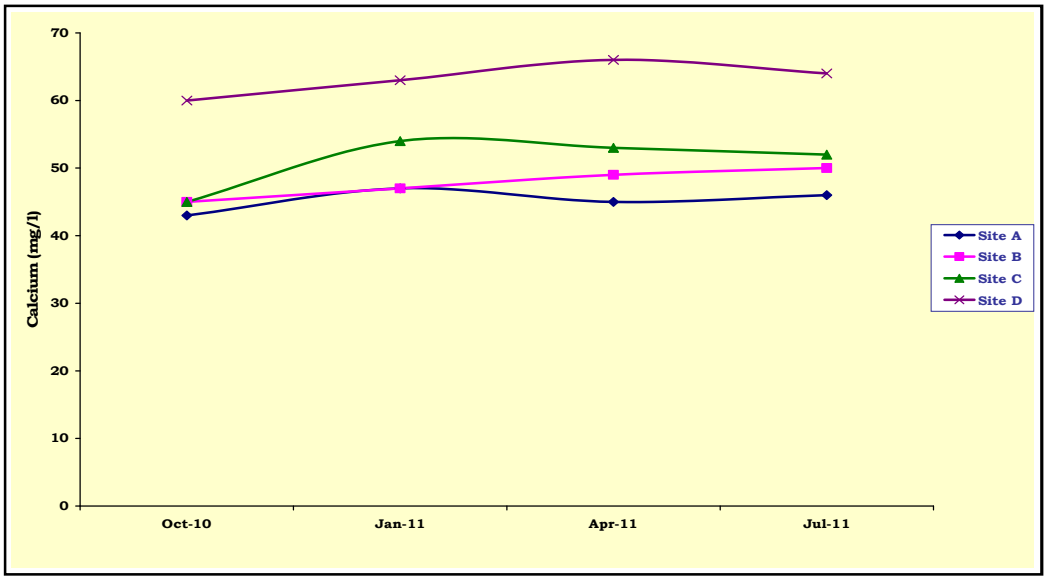

Fig. 2: Calcium in water sample at the four different stations at three months interval

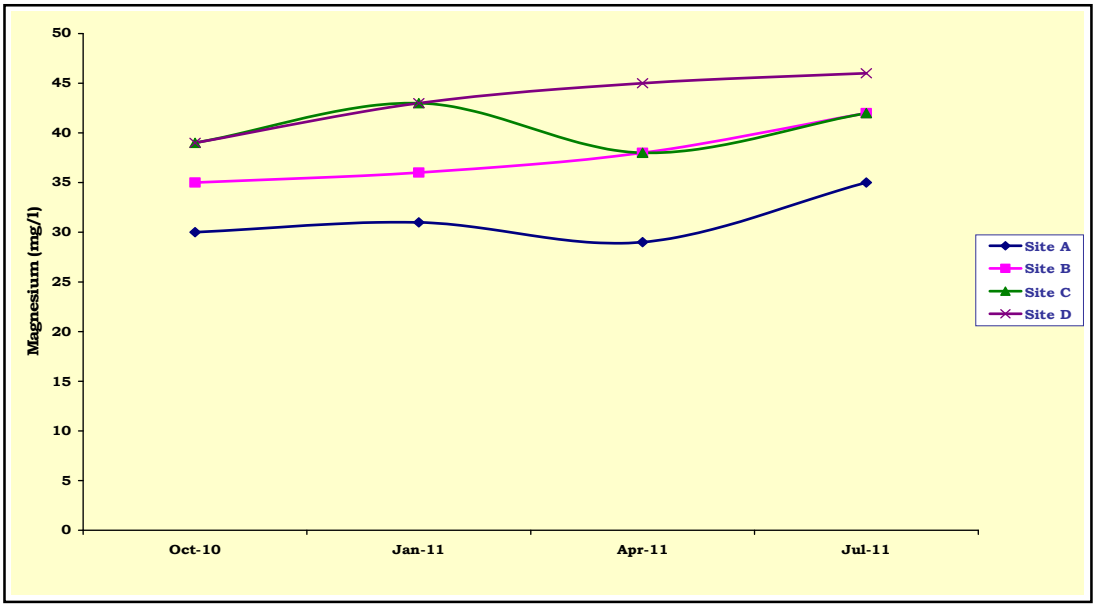

Fig. 3: Magnesium in water sample at the four different stations at three months interval

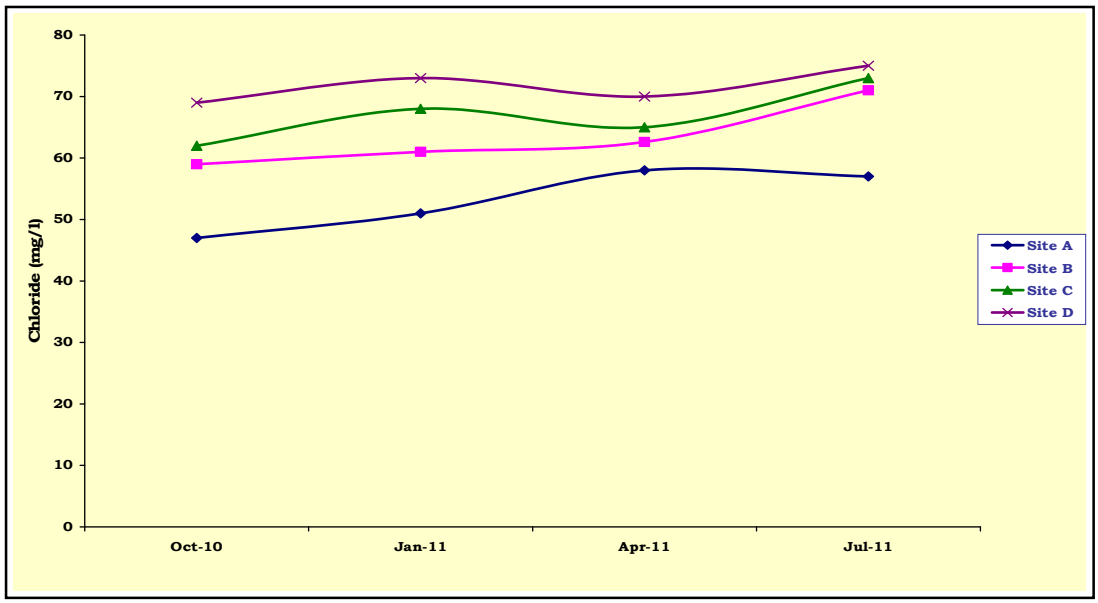

Fig. 4: Chloride in water sample at the four different stations at three months interval

Hardness of water indicates that boiling point of water increase due to presence of cations and Anions in water. In water hardness mostly occur due to major cations of Calcium and Magnesium. The Anion which is responsible for hardness of water is bicarbonate, carbonate, sulphate and chloride. Temporary hardness of water associated mainly due to carbonate and bicarbonates while permanent hardness of water is mostly due to sulphate and chlorides. The measurement of hardness of Asan River water in the present investigation increased throughout the study period. However increasing of hardness has been observed to be non significant in the month of July 2011. Probably due to the dilution of Asan River water but significant increase in hardness has been noted from Oct. 2010 to April 2011 may account for reduced availability of Asan water and

mingling of untreated sewage in the river. Further the hardness of water declined and remains almost constant in the month of July 2011. During this period it is due to rainy water. It becomes quite clear that the hardness of Asan water is due to increasing of different pollutant in River Asan.
The finding of hardness in the present investigation are in support to Das, *et al.* (1992), Sinha, *et al.* (1981), Sarita, *et al.* (2005) and Thakur, *et al.* (2007) who also reported high values of hardness in river Bhrahmputra, Sai, Sendth respectively due to discharge of domestic and sewage effluents. It is therefore concluded that the hardness of Asan River probably be due to the discharge of effluents and sewage as well as domestic waste in the river. As well as the underground water which is quite hard and contain calcium and magnesium also responsible for increasing hardness of Asan River because in Murena area ground water mostly used in domestic purposes which discharge on routine basis in river water. Further high values of hardness could be possible due to human activity including bathing, washing of cloths that incorporate use of detergent.
The present investigation clearly indicates that calcium and Magnesium are significantly increased at down stream site 'D' as compared to up stream site 'A' throughout this period. The increased values of calcium and Magnesium are probably due to the existing calcium and Magnesium in the ground water which is already an established fact. Various small scale industries of Murena directly are responsible as their effluents are being discharged in to river and thus increased calcium and Magnesium. Asan River receives million litres of untreated domestic sewage which is one of the causes for increase in calcium and Magnesium of Asan water. The above findings support by the finding of Rai, *et al*. (1990), Sinha, *et al*. (2005), Dinesh and Kanhere (2009) who also reported high values of calcium and Magnesium in river Godawari, Sabarmati and Asan River respectively due to discharge of industrial effluents. The ground water of Murena is very hard and contains high amounts of calcium and Magnesium in it.
Chloride present in all fresh water. In natural fresh water, however its concentration remains very less. The most important source of chloride in natural water is the discharge of sewage.In the present investigation date reveals that chloride value increased throughout the study period at down stream site 'D' as compared to upstream site 'A'. It is quite clear that different kinds of pollutants are responsible to increase chloride value in Asan River. Earlier, Dobbs, *et al.* (1963), Shankar, *et al*. (1983), Sinha, *et al*. (1981), and Dinesh and Kanhere (2008) also reported increased value of chloride due to the discharge of industrial effluents in river Reh and Sai respectively.

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