Physicochemical studies of Ground water and Koshi river of Baltara, Kumhraili and Sonbarsa in Khagaria District.

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Abstract.

Koshi river of Khagaria district flowing along the villages e.g. Baltara, Kumhraili and Sonbarsa bring devastating flood which causes abrupt change in ground water quality. Analytical tests of ground water samples for P^H, conductivity, Cr, Mn and Zn have been done with a view to know heavy metal contamination and alkalinity of soil too. Heavy metals especially hexavalent chromium posses carcinogenic characteristics when taken more than permissible limit of total chromium as 0.05 mg/ L. P^H more than permissible limit shows the alkalinity which adversely affects the growth of crops in the area. One of the reasons for accumulation of Cr(VI) and other pollutants may be due to flood and its channelization with flood water.

Keywords: Carcinogenic, Cr(VI), conductivity, Alkalinity.

Introduction:

Geographical status of Khagaria district is peculiar where majority of the population remains in water for three months every year during the rainy season (1-3). Due to devastating flood of Koshi taste and constituents of water change abruptly. Though the entire area of this district is surrounded by three rivers like Gandak, Ganga and the Koshi, the flood of the Koshi river is the main factor for degradation of water quality and rendering unfit for human consumption (4-5). Most of the population in this region use potable water from tubewells or directly from rivers(6-7). Baltara, Kumhraili and Sonbarsa villages are situated along the Koshi river and the population of these villages suffer from gastrointestinal disorder. In addition to this, the problem of iron contamination is common in the region. The utensils / container having the iron contaminated water develop a yellowish tint on the surface when kept overnight.

Chromium has been known to cause liver and kidney damage and few patients have been indentified suffering from liver related problems probably due to hexavalent chromium. Chromium exists in 0,+3 and +6 forms out of which Cr^{6+} is toxic and a result of anthropogenic activities (8-9). Cr^{3+} is inactive whereas Cr $^{6+}$ is labile in aqueous medium(10-11). The main species of Cr (III) in aqueous medium are Cr^{3+}, $Cr(OH)_3$ and $Cr(OH)^-_4$ whereas Cr^{6+} species are $HCrO_4^-$ or CrO_4^{2-} (12). Cr^{6+} is reduced to Cr^{3+} which is precipitated (13).

Manganese occurs in aqueous medium in domestic wastewater, industrial effluents. According to International standards for drinking water maximum permissible limit of manganese and chromium both are 0.05 ppm (14-16).

Regarding salinity there is possibility of increase due to perennial flood and water logging. P^H is the negative log of H^+ ion concentration in moles\ litres used

to know the acidic or alkaline nature of water. Electrical conductivity and P^H are one of physical parameters to find ionic composition and thermodynamic state.

Experimental: The water samples have been collected in sterilized sample bottles. The P^H of samples is known by glass electrode and P^H paper and the temperature is recorded at the time of collection of samples. The water bottles have been labelled from sample 1 to 36 collected from Kumhraili, Baltara and sonbarsa villages . The conductivity of the samples is known by conductivity meter mode no304. Hexavalent chromium concentration is determined by U.V. double beam spectrophotometer pharo 300. Manganese and Zinc concentration are also determined by U.V. double beam spectrophotometer.

Results and discussion:

p^H of water samples ranges from 7.8 to 8.5 which is within the UPSH standard. Conductivity measured in ms unit ranges from 0.23 for S_{27} sample to 1.75 for S_{18}(Table 1).In the case of ground water whether it is dugwell or tubewell, the P^H value is slightly alkaline in nature. It is worth mentioning that there is no Manganese contamination . Table 1 clearly shows that S_{18}, S_{21}, S_{23}, S_{24}, S_{31}, S_{32}, S_{33}, and S_{34} contain hexavalent chromium more than permissible limit whereas most of ground water samples contain Cr (VI) within permissible limit. Zinc concentration in ground water samples is below the permissible limit of 5ppm. During sample collection, care has been taken in identifying the population suffering from water borne diseases and the nearest possible source along the Koshi river. A minimum of 1 km distance has been maintained between the sampling sites. The results of heavy metal concentration in aqueous medium has been expressed in parts per million. The results have explained the distribution or types of ground water in selected villages along the bank of the Koshi river. It has also been revealed that the heavy metal concentration differ in the same water table. Aquifer at 110-120 feet selected for study is getting contamined with certain toxic metals eg. Cr (VI)

Table 1 : Analysis for Cr, Mn and Zn

Sample	Place	Depth in feet	Distance from Maheskhut Raiway station	Zn in ppm	Mn in ppm	Cr in ppm	Conductivity in ms	PH
S_1	Baltara	120	13 Km North East	1.00	No trace	0.01	0.30	7.8
S_2	Baltara	120	13 Km North East	1.30	0.04	-	0.25	7.8
S_3	Baltara	120	13 Km North East	2.00	0.03	-	0.24	8.0
S_4	Baltara	120	13 Km North East	1.42	No trace	--	0.24	7.8
S_5	Baltara	120	13 Km North East	1.30	No trace	-	0.24	8.0
S_6	Baltara	120	13 Km North East	2.6	No trace	-	0.25	8.0
S_7	Baltara	120	13 Km North East	1.8	No trace	-	0.24	7.9
S_8	Kumhraili	125	14 Km North	1.5	No	-	0.24	8.0

			East		trace			
S_9	Kumhraili	125	14 Km North East	1.9	No trace	-	0.24	8.0
S_{10}	Kumhraili	125	14 Km North East	2.1	No trace	-	0.25	8.0
S_{11}	Kumhraili	125	14 Km North East	3.1	No trace	-	0.24	8.0
S_{12}	Kumhraili	125	14 Km North East	2.6	0.02	0.01	0.24	8.0
S_{13}	Kumhraili	125	14 Km North East	2.4	0.01	0.02	0.72	8.1
S_{14}	Kumhraili	125	14 Km North East	2.3	No trace	0.01	0.71	8.3
S_{15}	Kumhraili	125	14 Km North East	1.5	No trace	-	0.69	8.5
S_{16}	Kumhraili	125	14 Km North East	1.6	0.01	-	0.75	7.9
S_{17}	Kumhraili	125	14 Km North East	1.8	0.01	-	0.79	8.4
S_{18}	Kumhraili	125	14 Km North East	1.4	0.01	0.05	1.75	8.4
S_{19}	Kumhraili	125	14 Km North East	1.2	No trace	-	0.78	8.4
S_{20}	Kumhraili	125	14 Km North East	1.3	0.01	0.04	1.12	8.4
S_{21}	Kumhraili	125	14 Km North East	1.3	0.01	0.051	0.56	8.2
S_{22}	Kumhraili	125	14 Km North East	1.5	No trace	-	0.76	8.5
S_{23}	Kumhraili	125	14 Km North East	2.9	0.01	0.06	1.28	8.2
S_{24}	Kumhraili	125	14 Km North East	1.67	0.02	0.06	1.12	8.3
S_{25}	Sonbarsa	110	11 Km North East	1.8	No trace	-	0.25	8.0
S_{26}	Sonbarsa	110	11 Km North East	0.09	0.02	-	0.24	7.8
S27	Sonbarsa	110	11 Km North East	1.2	0.04	-	0.23	8.2
S_{28}	Sonbarsa	110	11 Km North East	0.05	0.01	-	0.27	8.1
S_{29}	Sonbarsa	110	11 Km North East	No trace	0.02	-	0.23	7.8
S_{30}	Sonbarsa	110	11 Km North East	0.04	0.04	-	0.27	7.9
S_{31}	Sonbarsa	110	11 Km North East	1.6	0.01	0.06	0.23	8.0
S_{32}	Sonbarsa	110	11 Km North	0.02	0.02	0.07	1.58	8.4

			East					
S_{33}	Sonbarsa	110	11 Km North East	0.06	0.01	0.051	0.98	8.3
S_{34}	Sonbarsa	110	11 Km North East	1.4	0.01	0.08	1.32	8.4
S_{35}	Sonbarsa	110	11 Km North East	1.0	No trace	0.01	0.88	8.4
S_{36}	Sonbarsa	110	11 Km North East	1.3	0.02	-	0.62	8.2

Figure 1 : Google map showing Baltara, Kumhraili and Sonbarsa

Figure 2: Graphical representation of pH in ground water.

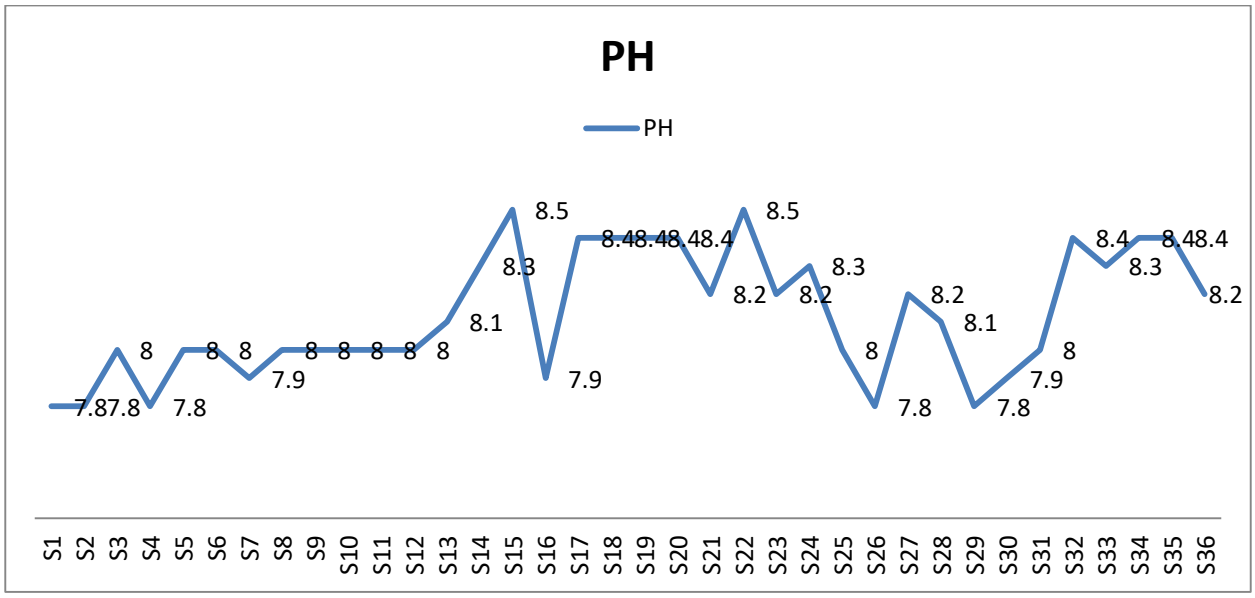


Figure- 3 Graphical representation of conductivity in ground water.

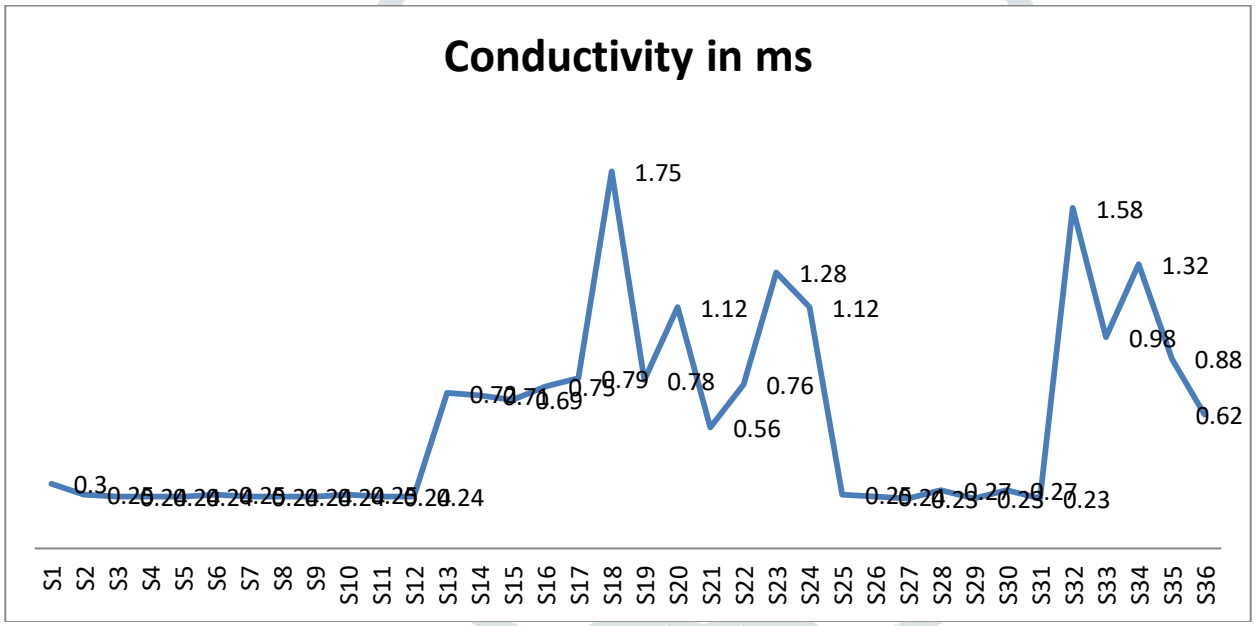
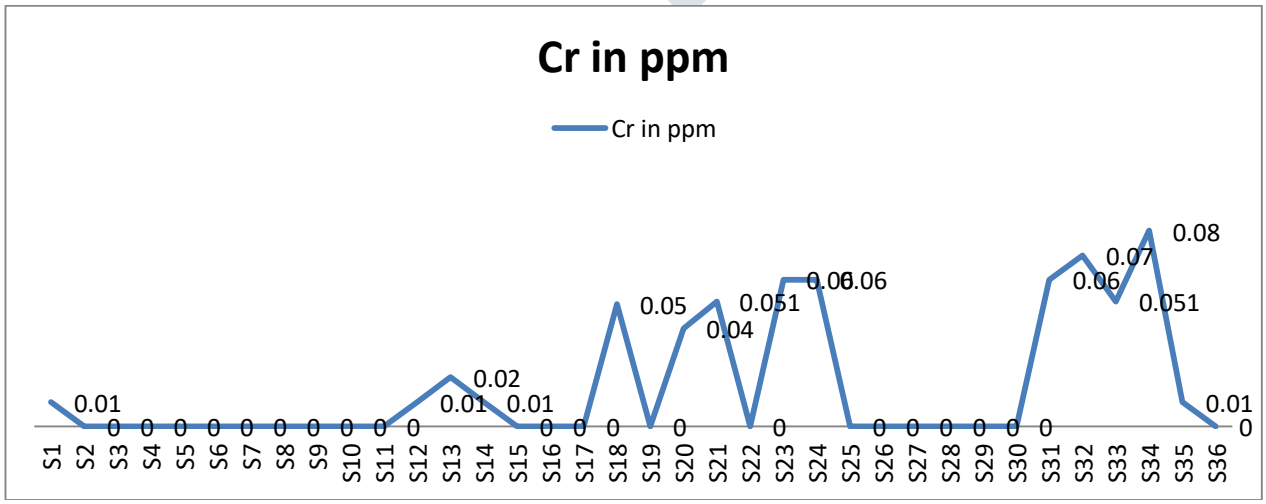


Figure- 4 Graphical representation of Cr (VI) in ground water.



Acknowledgements

I expressed my deep sense of gratitude to my supervisor. Dr Ashok Kumar Jha, University Department of Chemistry, T.M. Bhagalpur University , Bhagalpur for his guidance during the work.

I hearty acknowledge the co- operation of the staff of Chemistry Department of Naugachia in conducting the analytical tests with the help of U.V. double beam spectrophotometer, ion selective electrodes and Merkoquant kits.

It is also to be emphasized that this work have never been complete without the constant encouragement of Rtd. Prof. Bibekanand Mishra, University Department of Chemistry, T.M. B. U. Bhagalpur.

I can not, forget the helps of Principal, G.B. College Naugachia, Prof. Ashok kumar Sinha, for allowing me the laboratory of Chemistry Department of the college.

I feel indebted to Dr Arun Kumar Jha, Scientist, Bihar Agricultural University, Sabour for providing me with the facility of Atomic Absorption Spectrophotometer in soil science laboratory of the university.

I also acknowledge the encouragement of my wife Mrs Pratibha Kumari during the work and keeping me away from the family responsibility.

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