Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 4, Issue, 09, pp.063-065, September, 2012

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

IMPACT OF ANTHROPOGENIC PRESSURE ON THE WATER QUALITY OF RIVER JHELUM IN KASHMIR

Mohammad Farooq Mir[1], Syed Ifshana[1], Syed Abida[1], Showket Ali Mir[2] and I. A. Ahangar[1]

[1]Hydrobiology Research Laboratory, S. P. College, Srinagar
[2]Department of Fisheries, J&K

ARTICLE INFO

Article History:
Received 11th June, 2012
Received in revised form
15th July, 2012
Accepted 25th August, 2012
Published online 28th September, 2012

Key words:
Kashmir valley, Limnology, River, pollution, Hardness.

ABSTRACT

The River Jhelum is one of the main tributaries of the Indus River and is the longest river of Kashmir valley originating from Pir panjal range of mountains. A detailed limnological study of the River Jhelum was conducted in year 2010-2011. Five study sites were selected for the collection of samples from the Jhelum. The ionic composition of water of the streams varied in close relationship with the catchment pattern of the concerned water body. The water of the river was well buffered and pH > 7 was recorded. In upper reaches the River water was found to be medium hard type (Mean hardness= 93.7±mg/l) and in downstream the hardness was much more (Mean hardness 150±mg/l), it is because due to huge entry of significant quantities of nutrients rich surface runoff from human habitation.

INTRODUCTION

Man relies on natural resources to meet his basic needs. Nature and mankind form an inseparable part of life support system. Five elements of environment viz., Air, Water, Land, Flora and Fauna are interrelated and inter-dependent. Deterioration in anyone element affects the other elements. If the deterioration is for short-term, it repairs itself and reverts to the original state but if the deterioration continues, the whole-system including all life forms is thrown out of gear. The spoilage of the water quality and water's natural balance in its environment are known as water pollution (Akman *et al*., 2000). The pollution of a particular water body can always be linked to an industry, sewage or agricultural runoff (Subramanyam, 2006 and Sathware *et al*., 2007).Water quality assessment has become a big issue today because of the potential hazards associated with the use of contaminated water supplies.(Ali *et al*., 2007) . WHO (1997) has reported 80% of all sickness and disease in third world is due to consumption of contaminated water. It was, therefore, thought worthwhile to investigate the various ecological aspects of some of these water bodies.

MATERIALS AND METHODS

Study Area

River Jhelum is one of the main tributaries of the river Indus and is the longest river of Kashmir valley lies between 31° 70' and 34° 5' North latitude and 72° 70' and 80° 30' East latitude. River Jhelum is originating from pir panjal range of mountains and flows through till it falls into the Wular lake near Banyari village in Baramulla District. After its re-emergence from the Wular near Nilngli in Sopur, it takes a south westerly direction, leaves the valley through a gorge near Baramulla and continues its journey through Uri.

Physico-chemical determination

The variations of the physico-chemical factors of water were studied from January 2010 to December 2011.Monthly samples were collected from five selected sites in the early hours of the day during first week of every month. Water temperature and Air temperature were determined at the study sites within 4 to 6 hours. pH of the water was determined by using a portable pH mater. Conductivity was determined by using a conductivity meter. Dissolved oxygen, Free Co_2, Alkalinity, Chloride, Calcium and Magnesium, Total Hardness were estimated by titrimetric method recommended by A.P.H.A. (1998). Phosphate through (stannous chloride method) Ammonia (Phenate method) and nitrate (Salicylate method) were analyzed with the help of Systronics 106 spectrophotometer.

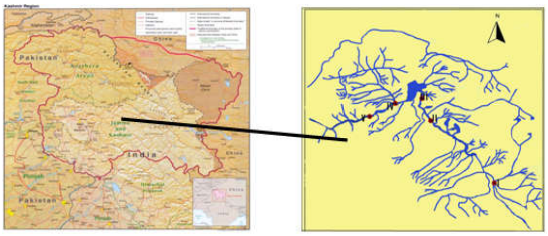

Fig1: Location of sampling sites in the River Jhelum.

**Corresponding author:* ahangarzoo@gmail.com

Table 1: Mean and Standard Deviation values of the physico-chemical characteristics of water of River Jhelum

S.No	Parameters	Site I	Site II	Site III	Site IV	Site V
1.	Air Temperature ^oC	19±8.27	20±8.07	19±8.21	19±8.28	19±8.12
2.	Water Temperature ^oC	15±6.81	16±7.15	16±6.80	15±7.05	15±6.86
3.	Conductivity µ S/Cm	169±10.42	187.2±10.31	195.5±29.90	216±48.78	270.7±55.29
4.	pH	8.1±0.60	7.7±0.42	7.9±0.46	7.9±0.80	7.7±0.39
5.	Free Co_2 (mg/l)	2.4±3.10	4.8±2.65	3±4.67	2.1±2.90	4.5±3.41
6.	Dissolved oxygen (mg/l)	8.8±1.01	7.7±0.63	7.8±0.80	7.5±1.04	8±0.63
7.	Alkalinity (mg/l)	150±35.71	147±34.23	131±35.51	129±38.82	118±29.07
8.	Total Hardness (mg/l)	101±30.46	116±39.09	134±47.72	150±44.33	130±44.19
9.	Calcium Hardness (mg/l)	31.6±15.20	39.5±20.05	43±20.16	49.7±19.80	39.3±13.56
10.	Magnesium hardness(mg/l)	15.6±7.00	17.3±8.85	21.1±8.94	24.4±9.55	22±8.22
11.	Chloride (mg/l)	10.4±3.19	11.4±2.93	11.7±3.09	11.7±4.00	10.7±1.74
12.	Nitrate µg/l	232.2±56.10	302.5±69.80	237.5±65.60	218±38.52	192.9±33.14
13.	Ammonia µg/l	91± 51.60	95± 52.42	123± 48.79	143± 38.48	134± 34.09
14.	Ortho-Phosphate µg/l	52± 21.72	75± 32.46	70± 19.32	83± 14.10	88± 25.15

RESULTS

The physico- chemical parameters of the River Jhelum were observed and are represented in Table 1.During the period of investigation, the Air temperature of the River was observed to fluctuate from a minimum annual mean value of 19^{o}C± 8.27 at site I, site III, 20^{o}C±8.07 at site II. However, the average water temperature in the study area ranged from minimum annual mean value of 15^{o}C ± 6.81 at site I, site IV and site V to a maximum 16^{o}C ± 7.15 at site II. The annual mean value of Conductivity fluctuated between the maximum 270.7 ±55.29 µS/cm at site V and minimum 169 ±10.42 µS/cm at Site I. pH of water showed a variation ranging from 7.7±0.42 to 8.1±0.60. Free carbon dioxide ranged between the maximum annual mean values of 4.8± 2.65 mg/l at site II and minimum 2.1± 2.90 mg/l at site IV and is absent in some months at all the sites. During the study period, the concentration of Dissolved oxygen ranged between the maximum annual mean value of 8.8 ±1.01mg/l at site I and 7.5± 1.04 mg/l at site IV. Alkalinity showed highest annual mean value 150± 35.75 mg/l at site I as against the lowest mean values of 118± 29.07mg/l at site V. The total hardness of river Jhelum fluctuated between the highest annual mean value of 150 ± 44.33 mg/l as at site IV against the lowest values of 101±30.46 mg/l at site I.

The calcium hardness recorded maximum annual mean value of 49.7± 19.80 mg/l at site IV and minimum of 31.6±15.20 mg/l at site I. On the other hand, magnesium hardness depicted highest annual mean value of 24.4± 9.55 mg/l at site IV and lowest of 15.6±7.00 mg/l at site I. During the study period, the values of chlorides fluctuated between 10.4± 3.19 mg/l at site I and 11.7± 4.00 mg/l at site III and site IV. Nitrogen and phosphorus are important factors in an aquatic ecosystem and play a key role in the productivity of an aquatic habitat. In the study conducted so far, values of ammonical nitrogen fluctuated between 91±51.60 µg/l at site I and 143 ± 38.48 µg/l at site IV. The annual mean values of nitrate nitrogen fluctuated between 302.5 ±69.80 µg/l at site II and 192.9 ± 33.14 µg/l at site V. The lowest concentration of ortho-phosphate was recorded at site I which recorded at annual mean value of 52.75±21.72 µg/l and the highest concentration was recorded at site IV with an annual mean value of 88.25±25.15µg/l.

DISCUSSION

The fluctuation in the flow and volume of water are closely associated with the meteorological conditions in the valley. In standing waters the atmospheric and water temperature fluctuate in close relationship with each other. However, in lotic habitat the continuously flowing water is not influenced much by the atmospheric temperature and as such significant variations occur between air and water temperature. The varied velocity of the water had its influence on the range of temperature difference between air and water with higher difference in fast flowing zones and less difference in slow flowing zones. The ionic composition of water varied in close relationship with the catchment characteristics of the concerned water body. The increased conductivity in the downstream 270.7±55.29 at site V showed a close relationship with the human activity in the catchment of the concerned water bodies. The water of the river Jhelum was well buffered and pH>7 was recorded at all the study sites. pH in the River fluctuated from 7.7 to 8.1.The lower pH in the Jhelum was indicated the impact of domestic sewage on the water as the decomposition of the organic matter results in the decrease in the pH value and increase in the carbon dioxide. In Rivers the occurrence and abundance of components of carbonate system and the pH are determined primarily by current and chemical nature of the substrate (Reid, 1961) Carbon dioxide was an important component of the buffer system in the river and fluctuated from 2.1± 2.90 mg/l to 4.8± 2.65 mg/l.

The concentration of Dissolved oxygen recorded from minimum 7.5±1.04mg/l to a maximum 8.8±1.01mg/l. Moderate content of dissolved oxygen (7.5± 1.04 mg/l at site IV) is due to high biological oxygen demand during decomposition of organic matter. Higher dissolved oxygen (8.8±1.01mg/l at site I) can be attributed to low biological activity as has been reported by earlier workers (Vass *et al.* 1977; Qadri *et al*. 1981). Highest Alkalinity in the River was mainly due to calcium and bicarbonate of calcium and Magnesium. The hardness seemed to be influenced by the anthropogenic activity in the catchment area. The total hardness of this river is compatible with the findings of (Yousuf *et al*. 2006). As per the total Alkalinity and hardness data, the river belonging to medium hard water type at site I mean hardness 101±30.46 mg/l but down stream at site IV 150± 44.33 mg/l it is because due to huge entry of significant quantities of nutrient rich surface runoff from the human

habitations as has been earlier reported by (Moyle, 1945). Calcium and Magnesium content showed trends similar to that of total hardness, their concentration increase downstream. Calcium and magnesium contents is possibly due to its uptake by the plants in the formation of chlorophyll-prophyrin metal complexes and in enzymatic transformation (Wetzel, 1975). Chloride fluctuated from 10.4± 3.19 mg/l at site I and 11.7± 4.00 mg/l at site III and site IV. The increasing chloride values in downstream depicted the anthropogenic influence on the river. Ammo nical nitrogen increases downstream. The increasing ammonical nitrogen values in downstream also depicted the anthropogenic influence on the river. Ammonical nitrogen are quite high in the Anchar lake, they are suggestive of high degree of sewage (Irshad *et al*., 2012). The concentration of Nitrate-N was the most dominant form of nitrogen after nitrite. Nitrate contents fluctuated from 192.9 ± 33.14 µg/l at site V to 302.5 ±69.80 µg/l at site II. Nitrate occurs in small quantities in unpolluted water but sewage contamination results in a significant increase in its contents.

Variation in nitrate concentration may be related to the aquatic systems from the catchment. Site II was located in Srinagar city where human population is mainly concentrated along the boundary of the river. Most of the human wastes are directly dumped into the river water. This is also indicated by the ortho-phosphate values at various sites. ortho-phosphate fluctuated from 52.75±21.72 µg/l at site I to 88.25±25.15µg/l at site IV. In the present study the nitrate and Ortho phosphate contents showed two peaks at all sites, one in the month of April, which can said due to the melting of snow which brings in huge runoff from catchment and then the concentration decrease upto June. After June their concentration started to increase till August. The increase in concentration during August may be attributed to large agricultural practices in the catchment of the River. The higher concentration of Ortho phosphate during warmer period can be attributed to decay and subsequent mineralization of dead organic matter and surface runoff (Cole, 1975).

Conclusion

On the basis of the present data it may be concluded that water of the river has changed from medium soft water type in the upper reaches to hard water type along its course due to anthropogenic pressure. In order to manage the riverine system for sustainable fisheries as well as for portable water as used presently, necessary steps need to be taken to stop entry of untreated sewage from the catchment.

Acknowledgements

The authors are cordially thankful to the scholars of the Hydrobiology Research Laboratory for their guidance and help. We are also thankful to the Minsistry of Environment & Forests, Government of India, for timely release of the funds for the investigation of the river. We are also thankful to the technical staff of the laboratory for their proper management of the laboratory. We also acknowledge the help provided by Mohd. Ayoub, Laboratory assistant, for hid consistant help.

REFERENCES

Akman, Y., O. Ketenoglu, H. Evren, L. Kurt and S. Duzenli 2000. Environmental pollution, Environmental Biology. 1st Edn. Palme Publication, Ankara.

Ahangar I. A., Saksena, D. N., Mir, F. A. and Afzal M. A. 2012. Seasonal variation in physico-chemical characteristics of Anchar lake, Kashmir. 2(2):352-357.

Ali, M.A., Ali, A. D. and H. I. Ohaeri. 2007. Bacteriological and physico-chemical characteristics of some water supplies at the senior staff quarters, University of Jos Plateau state. *Research Journal of Science, Volume 13, Nos. 1 & 2, 2007.*

A.P.H.A. 1998. *Standard Methods for Examination of water and wastewater. 20th* Ed. American Public Health Association, Washington, D.C.

Cole, G. A. 1975. Textbook of Limnology. The C.V. Moslbey Company. Saint Louise.

CSIR. 1974. Analytical Guide (Laboratory Techniques) CSIR, Pretpria, South Africa.

Moyle, J. B. 1945. Some chemical factors influencing the distribution of aquatic plants in Minnesota. *Amer. Midland Nat.* 34: 1-34.

Qadri, M. Y., Naqash, S. A., Shah, G.M. and Yousuf, A. R. 1981. Limnology of two streams of Kashmir. *J. Ind. Inst. Sci*., 63: 137-141.

Reid, G.K. 1961. *Ecology of Inland Waters and Estuaries*. Reinhold Publishing Corporation, New York.

Sathware, N.G., K.G. Patrerl. J. B. Vyas, S. Patel, M. R. Trivedi, L. M. Dave, M. M. Madia, P. K. Kulkarni, D. J. Parikh and H. N. Saiyed. 2007. Chromium exposure study inchemical based industry. *J. Environ. Biol.,* 28, 405-408.

Subramanyam, N. S. and A.V.S.S. Sambamurty 2006. Ecology 2nd Edn., Norasa Publishing House, New Delhi.

Vass, K. K., Raina, H. S., Zutshi, D. P. and Khan, M. A. 1977. Hydrobiological studies on River Jhelum. *Geobios*, 4:238-242.

Wetzel, R. G. 1975. Liminology. W.B. Saunders, Philadelphia.

W.H.O 1997. Health and Environment in sustainable Development Five years after the Earth summit. WHO, 1211 Geneva 27, Switzerland.

Yousuf, A. R., Bhat, F.A. and Mahdi, M.D. 2006. Limnological features of River Jhelum and its Important Tributaries in Kashmir Himalaya with a Note on Fish Fauna. *J. Himalayan Ecol*. Sustain. Dev. Vol.1

******