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## Physico-Chemical Analysis of River Jhelum (Kashmir)

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**Abstract** - The present study was conducted for the time period of one year (April, 2009- March 2010) with an aim to find out the physico-chemical nature of water at different sites of River Jehlum in order to access the physical properties and chemical nature of its water and the impact of site/s on their concentration. Three sites were selected for the study purpose and the samples were collected on monthly bases. The samples thus collected were processed for the detection of metals with their relative concentrations following the standard methods. It was observed that the concentration of these metals was varying with respect to the collection sites, so was the case with respect to its physical nature. Also it was observed that there was a difference in concentration of these elements at different sites when compared among them selves. The data of physico-chemical nature of water of river Jehlum obtained during the study have been mentioned in Table 1. Furthermore it was also observed that concentration of some of these elements was more than the permissible limits as recommended by WHO which could have a definite impact on life. Keeping the same in view the present study was taken into consideration in which an attempt was made to access the water quality of River Jehlum and it is believed that this study would be helpful in formulating control strategy in near future.

**Keywords** : *Water, Physico-chemical, Concentration, River Jehlum.*

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# Physico-Chemical Analysis of River Jehlum (Kashmir)

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## I. INTRODUCTION

Water is one of the most important components of life and life without it is impossible. However due to increasing anti-environmental human activities and some natural processes the quality of water is decreasing continuously and is posing a great threat to all forms of life including humans. Polluted water is the major cause for the spread of many epidemics and some serious diseases like cholera, tuberculosis, typhoid, diarrhea etc. Although several attempts have been made by a number of researchers (Harrison, 1958; Lenat and Crawford, 1994; Biggs, 1995; Gergel *et al.*, 1999; Caraco *et al.*, 2003; Donohue *et al.*, 2006) to study various aspects of water quality and the factors responsible for its degradation in order to formulate a significant control strategy all over the globe yet the problem is on rise. The need of the hour is to take immediate steps to treat the water and minimize its negative impacts. The fast changing lifestyle of Kashmir valley for last few decades including; the

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increasing rate of construction, development of small scale industrial units, increasing rate of transportation, human population, immense use of fertilizers and pesticides and use of some other harmful substance have bring a drastic change in the quality of water in almost all water bodies of valley including river Jehlum which has posed a great threat to life, therefore it was felt a must to take an initiative in to the same line in order to gain some kind of knowledge about the said problem. Keeping the same in view the present study was taken into consideration in which an attempt was made to access the water quality of River Jehlum and it is believed that this study would be helpful in formulating control strategy in near future.

## II. MATERIALS AND METHODS

The water samples from five sites of the River Jehlum were collected on monthly basis and were analyzed for detection of concentration of inorganic substances followed by standard methods (Apha, 1975; Golterman and Clyno 1969). Temperature was recorded by using a mercury filled thermometer. The thermometer was shaded from the direct sun light while taking the readings and the results were expressed as °C. pH of the water was determined by electrometric method using a laboratory pH meter, before taking the readings the Ph meter was caloberated by using buffer solution of pH 4 and Ph 9.2. All the readings were taken at 25 °C. Conductivity was determined by electrometric method using a laboratory conductivity meter. The alkanity was examined by using phenolphthalein indicator. Dissolved oxygen was determined by iodometric azide modification method. Chloride was estimated by argentometric titration method in the form of silver chloride,. Nitrate and nitrate was estimated by using colorimeter in the form of diazonium salts which combines water 1-nephthene hydro chloride o from pinkish redazodye. While free Carbon dioxide was estimated by tetramer method.

## III. RESULTS

The results obtained during the present study show that the physico-chemical nature of water of the river Jehlum has been affected and the concentration of some of the constituents has crossed the permissible

limit as recommended by WHO. At all the study sites minimum air temperature was recorded in the month of January 2009, with the lowest recorded temperature as 2.12 °C at site A, while as the maximum in the month of July 2010, with the highest 35.42 °C at site 3. Overall the temperature was high in summer and low in winter on an average. There was a moderate increase in temperature while moving downstream of the river. The pH was found within the range of 7.74-8.90 with the highest recorded at site A followed by B and C respectively, the pH was decreasing while moving downstream from site A to site C. Like wise the concentration of dissolved oxygen show a continuously decrease from site A to site C, the dissolved oxygen concentration was in between 6.25-7.75mg L<sup>-1</sup> with the minimum concentration at site C and the maximum at site A. However the situation was reverse in case of free carbon dioxide the concentration of free carbon dioxide was observed in between 0.2-3.12mg/litter and was highest at site C followed by B and A respectively. The concentrations of pH and dissolved oxygen were slightly higher during winter as compare to summer while as the concentration of free carbon dioxide was higher in summer and low in winter. There was a positive correlation in between pH and dissolved oxygen while a negative correlation between pH and dissolved oxygen with free carbon dioxide.

Like wise the conductivity was within the range of 299  $\mu\text{s cm}^{-1}$  at site A in the month of June to 455  $\mu\text{s cm}^{-1}$  at site C in the month of August, while site B recorded a conductivity of 368. The conductivity was found less than the permissible limits.

Chloride in water is generally due to the salts of sodium, potassium and calcium in the present study the chloride content was in the range group of 5.32-15.45mg/litre, being highest at site C (15.45mg/l) in the month of April and lowest (5.32 mg/l) at site A in the month of January, while site B recorded a concentration of 6.53 mg/l. The comparison of chloride content of present values with that of the WHO reveals that it is much lower than the permissible limits.

It was also observed that the concentration of nitrates was more than the permissible limits. The value ranged between 320mg/litter at site B to 630mg/l at site C and it was 485 mg/l at site A. Similarly the concentration of nitrite was within the range of 61-197mg/l with the highest concentration at site C (197.5 mg/l) followed by B (115.3 mg/l) and A (61.56 mg/l) respectively. Furthermore it was also observed that the concentration of calcium was varying with respect to the sampling sites and was within the range of 36.8-57.6mg/l which is within the permissible limits. The average concentration was lowest at site A (37.20 mg/l) followed by B (42.31 mg/l) and C (47.64 mg/l) respectively.

*Table 1* : Physico-chemical properties of Water at different sites of River Jehlum

Parameters	Sampling Sites		
	A	B	C
Temperature (°C)	2.12 (Min)	16.13 (Avg)	35.42 (Max)
pH	8.90	7.92	7.74
Conductivity ( $\mu\text{s cm}^{-1}$ )	299	356	455
Alkanity (mg/l)	100	110	116
Free CO <sub>2</sub> (mg/l)	25	28	24
Chloride (mg/l)	11	15	13
Nitrates ( $\mu\text{g/l}$ )	926	1370	1308
Nitrites ( $\mu\text{g/l}$ )	197	115.3	61
Calcium (mg/l)	42	37	47

#### IV. DISCUSSION

The results obtained during the study show that the geographical location and season have a direct impact on the various physico-chemical properties of river Jehlum. Air temperature at different study sites followed the general climatic regime of the valley with minimum in January and maximum in July. Although the winter air temperature at times goes below freezing point yet the water did not freeze the reason for which could be the insulating function of snow and ice (Sheridan, 1961), also the temperature required to freeze running water is very low (Needham and Jones, 1959). The reason for comparatively low temperature at site A could be due to the presence of more plants at this site which shades the site at their and makes it less visible to direct sun light. The alkaline nature of water could be attributed to the buffering properties of some inorganic substances (Kang *et al.*, 2001). The increase conductivity towards downstream could be due to the increased urban and agriculture land use drainage into the river (Gray, 2004). The various ions added to the water from catchment areas regulate the conductivity of the water (Golterman, 1975). The higher concentration of DO during winter could be due to the fact that cold water contains more oxygen as compared to warm water as the DO is inversely proportional to the water temperature (Hynes, 1960) in addition photosynthesis could have some kind of effect on DO (Berg, 1943). The increasing trend of free carbon dioxide down the river could be due to the addition of some carbon rich substances as majority of carbon comes from organic matter such as ground water, rock leaching, dead

terrestrial plant material (Wetzel, 1992). The gradual increase in chloride concentration down the river could be due to the increase in urban land use and due to the addition of some industrial/factory discharge (Livingstone, 1963; Woods, 1965; Allan, 1996). The reason for higher concentration of nitrates than the permissible limits could be due to the excessive use of fertilizers, pesticides and addition of human excretory products. The downward increase in nitrite is in contest with many reports all over the world; Osborne and Willey, 1988; Field *et al.*, 1996; Herlihy *et al.*, 1998. This could be because of the less concentration of dissolved oxygen in lower parts of river which decreases the conversion of nitrate and nitrite. The reason for increasing trend of calcium down the river could be increased concentration of waste material especially the calcium rich substances like bones and milk products of slaughtered and killed animals.

## V. CONCLUSION

From the present study it is clear that the water quality of River Jehlum has been degraded qualitatively and the concentration of some constituents has passed the permissible limits and this could pose a great threat to the all kinds of life directly or indirectly therefore steps must be taken to protect this divine gift of nature and the present study is a step towards the same.

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