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Evaluation of water quality in river Indus at Pattan Khyber Pakhtunkhwa Pakistan

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Abstract

The current research was conducted to explore the concentration of water quality of River Indus at Pattan site Khyber Pakhtunkhwa, Pakistan. The chosen water quality parameters were Temp °C; pH; Dissolved Oxygen mg/l; Electrical Conductivity µs/cm; Total Alkalinity mg/l; Total Hardness mg/l; Chlorides mg/l and Total Dissolved Solids mg/l correspondingly. Some samples were analyzed on the fields like pH, Temperature, TDS, E.C and DO while Total Alkalinity mg/l; Total Hardness mg/l and Chlorides mg/l were examined by titration methods. Samplings were carried out on monthly bases. The results revealed that water quality parameters were consider suitable for irrigation, fish growth and survival.

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Introduction

Water quality refers to the chemical, physical and biological properties of water. Water quality assessment generally involves analysis of physicochemical, biological and microbiological parameters and addresses abiotic and biotic status of the ecosystem (IAAB, 1998; Kulshrestha and Sharma, 2006; Mulani *et al.*, 2009). Many of the major problems that humanity is facing in the twenty-first century are related to water quantity and water quality issues (Ali, 1993). These problems are going to be more aggravated in the future by climate change, resulting in higher water temperatures, melting of glaciers, and an intensification of the water cycle, with potentially more floods and droughts (Crawshaw, 1997). Limnology is closely related to aquatic ecology and hydrobiology, which study aquatic organisms in particular regard to their hydrological environment Limnology is the study of freshwater or saline water which contained within continental boundaries Limnology embraces lakes, rivers, streams and estuaries, As well as host of micro habitats which are often over looked by the casual observer. These microhabitats include springs, old watering troughs tree holes and the unique environments formed in abandoned cans. Limnology applies to running or lotic as well as standing or lentic water, (Goldmen and Horne, 1983).

Materials and methods

Study area

The Pattan station of River Indus is very popular site of the River Indus. This point is rich of water bodies and hence found clean as compared to the other points along with the River Indus. Almost Ichthyo fauna was recorded from this site due to water rich zone. This site is too much green and so also provide a recreation place for the tourists. Besides all these this site was clear.

Water sampling and analyzing

Water samples were stored in clean and dry plastic bottles with screw caps and labeled. Some parameters were analyzed on the spots by using digitals meters while other were examined by titration methods.

Analysis of field study parameters

During the field study the following water quality parameters were analyzed on the spot discussed in detail below.

Dissolved Oxygen: The dissolved oxygen of water samples was measured by digital DO meter (Model: EZDO-7031. Taiwan).

pH determination: The pH of water samples was measured by using pH meter (China).

Electrical Conductivity: Electrical conductivity was measured by EC meter (China).

Total Dissolved Solids: Total Dissolved Solidswas measured by Digital TDS meter (China).

Temperature: Temperature was measured by Digital Temperature meter (China).

Analysis of laboratory titration parameters

Some water quality parameters like Total Alkalinity, Calcium Hardness, Water Chlorides and Total Hardness were analyzed by titration methods. Parameters discussed in detail below.

Total alkalinity: Water sample (25 ml) was titrated with a pre-standardized H_2SO_4 solution. Methyl orange was used as an indicator. The used acid solution was noted from the burette. The values were calculated by applying the following formula:

Total Alkalinity = (Vml of H_2SO_4 + 25) 5000 * N

Where, Vml stands for the volume of acid solution which was used and measured in ml.

N stands for familiarity of the acid solution.

The above mentioned formula will give result for alkalinity in mg Calcium carbonate /L directly.

Water chlorides: 25ml sample was treated with 0.02N H_2SO_4 solution (corresponding to the alkalinity of the sample) followed by the adding of 3-4 drops of the $K_2Cr_2O_7$ solution (indicator).

After that the solution was titrated with standard $AgNO_3$ solution (0.014 N) taken in particular sort of burette.

The volume of silver nitrate solution was noted.

The formula which was used as follow:

Weight of Cl^- mg/L= (Atomic weight of Cl^- xVL*Nx10^2) + 25

Where, VL indicates the volume of $AgNO_3$ solution used considered in liters and N stands for familiarity of $AgNO_3$ solution.

Total hardness: Clean titration flask was used for such purpose in which 25m;l sample was taken along with 2ml NH_3/NH_4CL buffer solution of pH=10 was also added.

After shaking a small amount of solid Eriochrome black T, just enough for color change (as an indicator), was added with spatula. This started titrating against standard EDTA solution taken in burette after shaking. The used volume was noted as $caco_3$ mg/l.

The formula which was used as follow:

Molecular weight of $CaCO_3$ in 25ml sample = molecular weight of $CaCO_3$xVL of EDTAxM of EDTA. Where VL indicates volume of EDTA solution used which was measured in liters and M indicates the molarities of EDTA solution. After this the calculation were prepared for the weight of $caco_3$/l of sample as:

Total hardness/l as= $\frac{VLxMx100x100}{Ml\ of\ sample}$

Results and discussion

The present investigation was carried out to analyze the amount of water quality of River Indus at Pattan site Khyber Pakhtunkhwa, Pakistan. The selected water quality parameters were Temp ^oC; pH; Dissolved Oxygen mg/l; Electrical Conductivity µs/cm; Total Alkalinity mg/l; Total Hardness mg/l; Chlorides mg/l and Total Dissolved Solids mg/l respectively. Some samples were examined on the fields like pH, Temperature, TDS, E.C and DO while Total Alkalinity mg/l; Total Hardness mg/l and Chlorides mg/l were analyzed by titration methods. Samplings were carried out on monthly bases.

Table 1. Water quality **(**Mean ± SD) of Pattan sampling station in river Indus during 5 years Study period (2013to 2018).

Months	Temp ^oC	pH	DO mg/l	TDS mg/l	T. Alkalinity mg/l	T. Hardness mg/l	Chlorides mg/l	E.C µs/cm
Jan	15.37±3.89	7.77±0.44	7.61±0.25	106.46±52.58	106.29±16.45	89.52±33.24	21.64±4.44	249.53±35.59
Feb	16.25±2.88	7.68±0.84	7.42±0.61	116.26±41.44	113.68±25.51	92.85±24.45	27.59±6.65	255.56±43.45
Mar	18.34±4.35	7.65±0.35	6.24±0.51	119.26±42.74	125.59±31.62	104.46±19.54	37.91±7.24	266.26±26.26
Apr	20.34±2.43	7.41±0.42	6.52±0.24	137.89±42.09	136.2826±.55	114.91±17.48	44.58±7.91	276.27±26.55
May	20.38±3.28	7.21±0.29	6.75±0.51	149.26±56.42	153.29±21.24	123.59±16.57	56.79±10.55	284.75±42.64
Jun	21.43±3.99	7.19±0.97	5.75±0.34	155.48±45.62	165.39±18.54	132.58±25.58	61.59±13.49	296.49±23.82
July	23.74±3.38	7.22±0.35	4.25±0.66	179.26±48.62	175.84±35.58	145.27±26.54	63.86±12.25	294.55±39.58
Aug	22.72±2.24	7.34±0.29	5.14±0.81	175.58±41.37	155.71±31.44	135.41±42.47	56.64±11.12	296.53±43.25
Sep	20.94±1.93	7.37±0.97	6.42±0.39	157.29±46.61	143.29±28.24	124.14±42.55	45.96±8.45	288.26±46.45
Oct	16.47±2.24	7.53±0.27	6.42±0.41	147.26±41.12	135.46±30.84	113.78±41.56	36.59±5.75	275.86±28.48
Nov	14.43±3.12	7.64±0.15	6.61±0.24	139.46±43.19	131.49±29.21	105.89±38.52	32.56±4.21	267.47±36.56
Dec	15.67±3.06	7.74±0.04	7.35±0.74	119.69±42.29	116.48±32.55	91.82±36.54	23.56±3.28	245.43±42.48

The results shows the water quality parameters. A research survey was carried out by Mohsin *et al.* (2013) to assess and compare the ground water quality with WHO standards and its related diseases in Bahawalpur City. Three sample areas Satellite town, Shahdrah and Islamic colony were chosen and two water samples have been taken from each area. Data collection based on the questionnaire and laboratory analysis of water samples. Certain physical and chemical parameters like total dissolved solids (TDS), electrical conductivity (EC), pH, hardness, alkalinity (Alk) etc. was examined to find out quality

of ground water. Findings reveal that groundwater quality in Bahawalpur is deteriorating. Situation was much worse in Islamic colony where 48%, 55% and 41% residents have diluted, brackish and water with slight smell respectively. Laboratory analysis of water parameters also disclosed the fact of significant contamination in ground water. EC, TDS, hardness, pH etc were considerably high from WHO permissible limits. Such poor quality of water reasoned severe waterborne diseases like diarrhea, cholera etc. Similarly, during a study conducted in Pakistan's biggest city Karachi, out of hundreds of samples of water no one was found safe for drinking purposes (Ihsanullah, 2009). Another study conducted in district Kohat (KPK) analyzed 18 samples collected from different sites to test the physiochemical parameters i.e. pH, TDS, Alkalinity, Electrical conductivity etc. Results indicate that most of the samples were contaminated (Ahmad *et al.*, 2012).

Conclusion

The present study was carried out in River Indus at Pattan sampling station Khyber Pakhtunkhwa Pakistan to explore the amount of water quality. From the current results it can be concluded that water quality was normal for the fish survival and breed.

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