

Assessment and Identification of the Quality Gradients of Canal Water used by Lahore, Pakistan Residents in Summer

Humza Bin Masood
Environmental Sciences Program
FC College, Lahore, Pakistan

Dr. Seemal Jelani
Associate Professor, Department of Chemistry
FC College, Lahore, Pakistan

Abstract—The study was conducted to evaluate the physical, chemical and biological characteristics of Lahore canal from BRB (Banbawali – Ravi Bedian canal) Junction to ThokarNiazBaig flyover, city Lahore, Pakistan as this canal water is extensively used for swimming and irrigation purposes. Among all the sample sites concentration of copper, chromium and zinc in the canal water were found higher as expected which may result in reaching the NEQS (National Emission Quality Standards) in future as population is increasing. The ranges observed were acidity 6.84-6.97 pH, biological oxygen demand 0.1-0.3 ml/L, total dissolved solids 0.012-0.0264 g/L, total suspended solid 1.359-1.604 g/L, metal contents shown by Atomic Absorption Spectra; copper 0.02-0.25 mg/L, chromium 0.067-0.523 mg/L and average zinc 0.229-0.704 mg/L as well as presence of blood worms explains the potential exposure risk to human health, biological organisms and surrounding environment. Our study emphasizes the need of monitoring and implication of control on swimming as well as proper treatment for canal water for irrigation purposes.

Index terms -AAS (Atomic Absorption Spectrum); pH (Power of Hydrogen); BOD (Biological Oxygen Demand); TSS (Total Suspended Solids); TDS (Total Dissolved Solids); Blood Worm; Lahore Canal; Lahore City; Pakistan.

I. INTRODUCTION

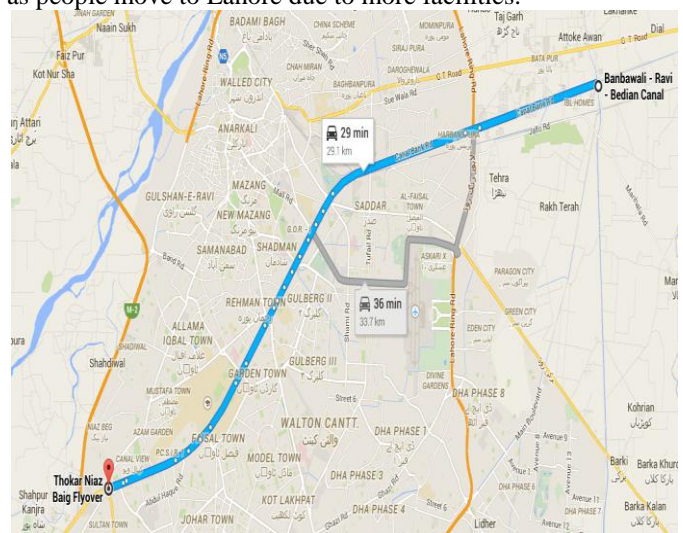
Canal of Lahore, Pakistan is approximately 29.1 Km long from BRB Junction to ThokarNiazBaig (Google Maps). This canal has different drains opening at different places and this is causing different diseases [1]. The study focuses on the amount of Copper, Chromium and Zinc in the sample. Copper help in curing many diseases and is used in many medicines but on the other hand it is a cause of Alzheimer’s disease [2], Chromium may results in Cancer [3], Among all the metals Zinc is the one which is the major cause of causing Allergy [4].It is reported that the people who use to swim in Canal water of Lahore, Pakistan use to show the signs and symptoms of red skin, itching, skin spots which results in allergy [5]. It is also been reported that People use to urine in Lahore canal while swimming which causes health effects [5]. The presence of *N. fowleri* is also expected which results in damage of brain cells [5]. The water of Lahore canal is used for irrigation purposes and only 0.01% water is treated before irrigation [6]. The presence of Urea, Creatinine and Potassium is expected as people use to urine and these are the basic components of

urine [7]. Urea is used medically for abortion and causes eye irritation, skin irritation, cardiac disturbances, adverse reproductive effect and blood electrolyte balance [8].Potassium may result in stomach upset, nausea, diarrhea, vomiting, intestinal gas and other side effects [9] while Creatinine may result in Parkinson’s Disease [10]. The common observation shows that the water is more clear near BRB as compare to Thokar as it used to pollute more by public of Lahore, Pakistan as well as different drains opening is present at certain places as reported in Daily Times. More over swimming in Lahore Canal is prohibited (City District Government Lahore) but there is no proper law to ban swimming in Lahore Canal.

II. MATERIAL AND METHODS USED

A. Study Area

The area was analyzed for the basic of swimmers in Canal Water especially in summer season. The area is situated at the GPS Coordinates of 31° 35’ 9.05” North and 74° 30’ 1.88” East to 31° 28’ 15.65” North and 74° 14’ 30.99” East. Lahore is the second largest city of Pakistan after Karachi which is located in Punjab Province and it is the capital of Punjab. Current Population of Lahore is little over 7 million with the current population growth rate of 2% [11]. It is believed that in near future the city will turn in to a megacity as people move to Lahore due to more facilities.



B. Water Sampling

To reduce the risk of sampling error the samples were collected at the distance of each 5Km at the both sides of the Canal in the air tight bottles so any external contamination may not take placed. Samples were roughly labeled on spot which were neatly labeled at the laboratory. Bottles were rinsed with the canal water on site to reduce the sampling error. The last sample that was collected was at the 29.15 Km which was the last site and was made the part of study.

C. Analysis

Common lab methods were adopted that may result in reducing error and accurate results like pH meter for pH analysis, AAS (Atomic Absorption Spectra) for detecting Zn (Zinc), Cu (Copper) and Cr (Chromium), Filtering and weighing dried paper of 100 ml water for TDS, Evaporating and weighing beaker for TSS, Conductivity Meter for conductivity, Biological culture for BOD, visual analysis for Color and Turbidity. All the analysis was performed on the basis as per required lab standards. Field surveys were also performed as required to check the ecological effects and anthropogenic activities affecting the certain area and resulting change in dissolved solids and BOD levels. Blanks were prepared as per requirement of AAS.

D. Quality Control/Quality Assurance (QC/QA)

To get the quality assurance samples were focused for strict quality control as per required standards. Apparatus were cleaned properly and samples were calibrated daily as per required standards. For the strict quality assurance far further technology for analysis were used such as AAS (Atomic Absorption Spectrum), pH meter, Conductivity Meter, etc. Blanks were prepared as per requirement of AAS. To protect the samples from contamination samples were collected and preserved in airtight containers. The solvents used in the study were redistilled for the quality assurance.

III. RESULTS AND DISCUSSION

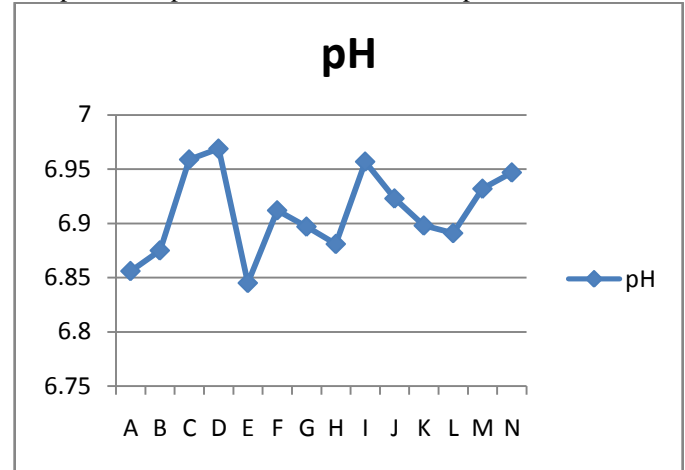
The visual analysis of the samples shows that each of the sample was turbid and was brown in color due to soil particles present in the sample that use to float with water. For the statistical analysis the samples were named as follow.

Table 1: Scientific name of Samples

Sample Name:	Labeled for AAS
0 Km FC Side	A
0 Km Opposite Side	B
5 Km FC Side	C
5 Km Opposite Side	D
10 Km FC Side	E
10 Km Opposite Side	F
15 Km FC Side	G
15 Km Opposite Side	H
20 Km FC Side	I
20 Km Opposite Side	J
25 Km FC Side	K

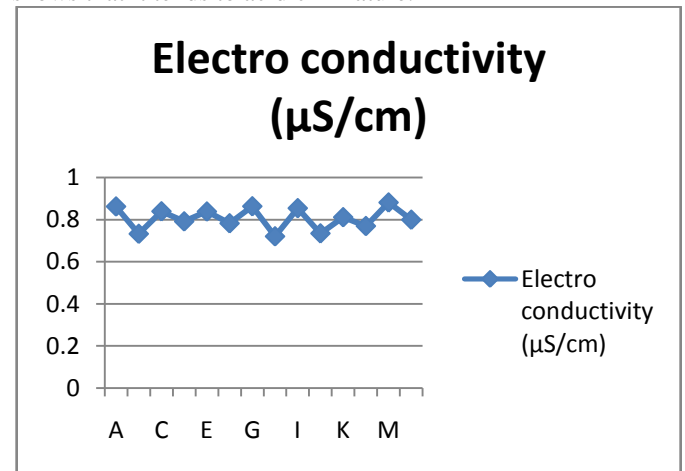
25 Km Opposite side	L
29.15 Km FC Side	M
29.15 Km Opposite side	N

The pH of samples shows the results as expressed as under



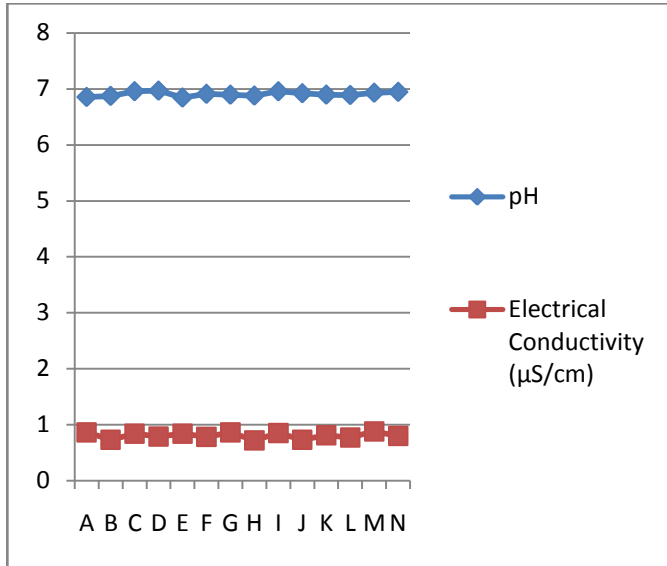
Graph 1: pH of the samples

The pH of the samples shows that the samples are little acidic as the results of sample “E” is near 6.84 and sample “D” is near 6.97. While the average range is 6.910 which is almost near the neutral levels but at the sample time none of the sample had reached the value of pH “7” or crossed “7” which shows that it tends to acidic in nature.



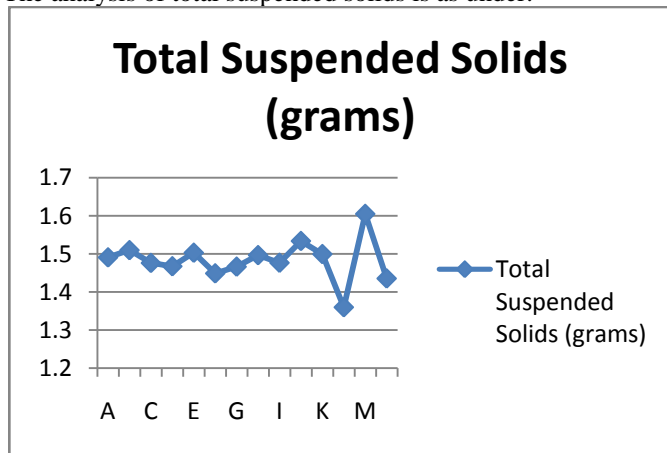
Graph 2: Electro conductivity of Samples

The electro conductivity of the samples shows that there are some salts as in drinking water even as expressed above. The average electro conductivity of the sample is 0.805µS/cm. The comparison of Electro conductivity and pH of samples is shown as under.

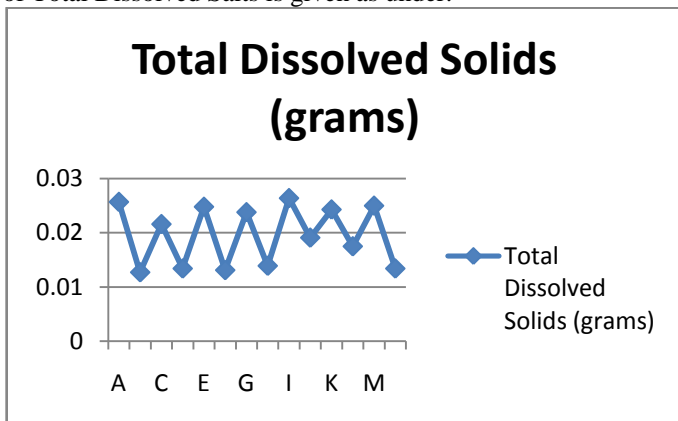


Graph 3: Comparative analysis of pH and Electro conductivity

The comparative analysis of pH and electro conductivity shows that the electro conductivity is not affecting the pH which shows that there are salts but they are not affecting the pH as there will be some basic as well as acidic salts in water. The analysis of total suspended solids is as under.

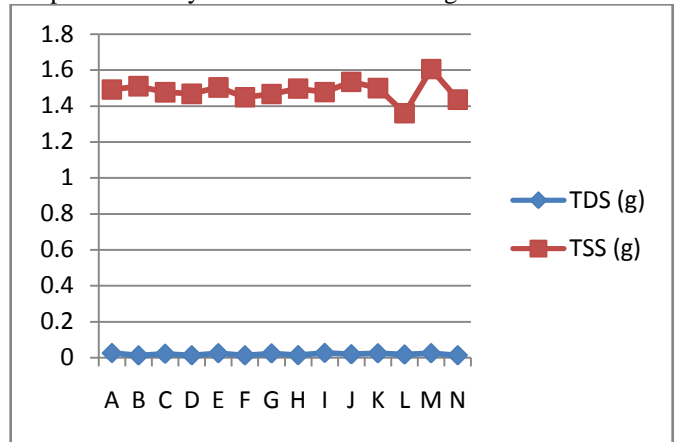


Graph 4: Analysis of Total Suspended Solid (grams)
 The average Total Suspended Solids is 1.4832g. The analysis of Total Dissolved Salts is given as under.



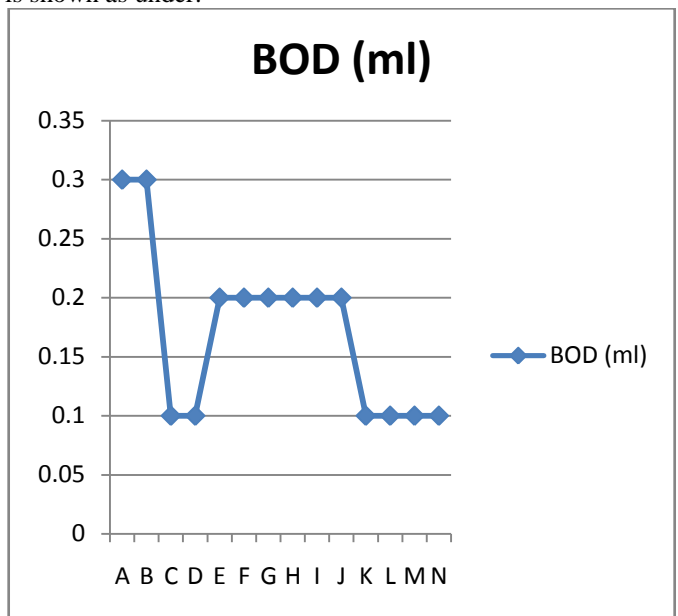
Graph 5: Analysis of Total Dissolved Solids (grams)

The average TDS (Total Dissolved Solids) is 0.916 grams. The comparative analysis of TDS and TSS is given as under.



Graph 6: Comparative Analysis of TDS (g) and TSS

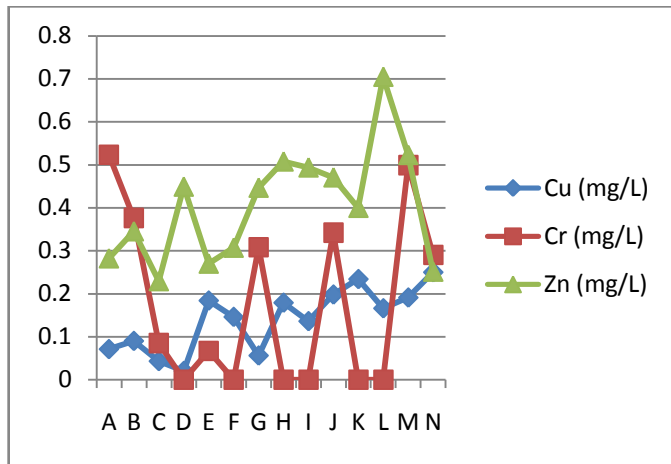
The results show that the TDS and TSS is nondependent on each other. The BOD (Biological Oxygen Demand) was measured on 5 days basis by help of biological culture which is shown as under.



Graph 7: BOD analysis of samples

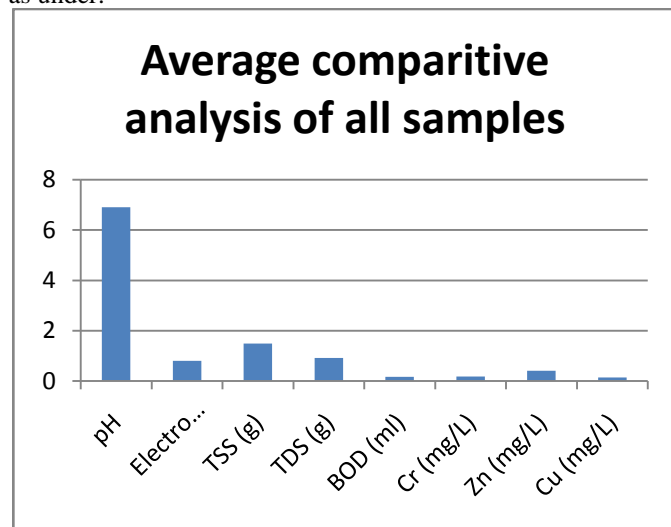
BOD (Biological Oxygen Demand) was more at BRB Junction where the water is clean and we can find small fishes and can see water less turbid and people hunting the fishes. The BOD was more at the middle of the canal where some people were found selling some meat to throw in water so crows and eagle can catch that meat as a food but most of them use to flow with water increasing the rate of bacteria resulting in higher BOD.

The comparative analysis of Cu, Cr and Zn is shown below which were analyzed by help of AAS (Atomic Absorption Spectra).



Graph 8: Detection of Cu, Cr and Zn (mg/L)

The results show that the average amount of Copper is 0.1402mg/L, Chromium 0.1778mg/L and Zinc 0.4056mg/l. The amount of these levels is expected to increase in near future as the population in the area is increasing day by day. The average comparative analysis of all the samples is given as under.



Graph 9: Average Comparative Analysis of all samples

Pakistan doesn't have any standard NEQS (National Environmental Quality Standards) but some are defined by CPI (Cleaner Production Institute) and the results shows that none of the value had reached or exceed the NEQS given by CPI, which explains that none of the physical or chemical characteristics are harmful to death but can cause certain illness like itching, nausea, etc.

A. Blood Worms in Sample

Blood Worms also known as Water Red Worms were also found in the samples collected near BRB Junction. These worms were not the part of planned study but due to their hazardous effect on human health that was considered the part of study. Blood worms belong to the Phylum "Annelida" (Round Worms) and Genus "Glycera" and the scientific name is *Glyceradibranchiata* (Encyclopedia of Zoology). These worms were creamy pink in color and had segments on their

entire body. The worms were like almost 1-2 cm in length. The parapodia of blood worms has two finger-like gills where gases are exchanged with their body fluids and movement take place by help of muscle contraction, common name of these worms is "beak thrower"[12]. The blood worms have four hook-like teeth which attach allows them to attach the body of their prey and they release the poison in their body. This poison is not enough to kill a human but can cause pain and itching which can result in to allergy and nausea in human [12]. Teeth of the blood worms are made of copper and longer exposer can result in Alzheimer's disease and Jaws contains Zinc which can result in allergy [13]. Doctors explain that the people complain about itching and show the symptoms of allergy after swimming in this canal. These blood worms on one side are an important source of food for fishes and help in regulating of economy. These worms are used by fish hunters for fishing [12]. It is difficult to say that these worms are coming with flow from India or are used by fish hunters but the thing is that it can swim to further parts and have ability to effect human health.

IV. RECOMMENDATIONS

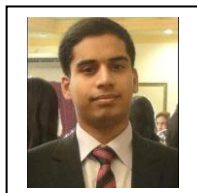
Even the physical and chemical characteristics shows none of the levels which can affect the human health but even as there is some amount of Chromium which can result in cancer and it also have blood worms which can result in Alzheimer's disease, nausea and allergy. It is highly recommended not to take bath in canal water of Lahore. Even the City District Government Lahore is stopping people from swimming in this canal but as there is not a specified law for these people so government should make a law and people who use to swim in this water they should be fined. Even there is social issue and Pakistan is facing energy crisis in terms of electricity and water so people come to canal to take bath but on the other hand it is making difficult for health sector as well. So, it is highly recommended to stop people from swimming in this canal and stop the draining of sewerage water in canal.

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Authors Profile



Humza Bin Masood has to receive the **BSc (Hons)** degree in Environmental Sciences from the FC College, Lahore, Pakistan in 2015, currently looking forward for **MPhil** Admissions in Environmental Sciences. His research interest includes the water resource

management, chemtrails, soil resources, solid waste management and English literature.



Dr. Seemal Jelani received the **PhD** degree in Organic Chemistry from the Punjab University Lahore, Pakistan, Currently she is an associate professor of Organic Chemistry at FC College, Lahore, Pakistan. Her research interest includes Natural Products, Textile Chemistry,

Environmental Chemistry, Green Chemistry and Food Sciences.