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# Comparative study and Physico Analysis of River water at different sites

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## Abstract

Rivers play important role to human life. According to the old history, human civilizations were developed on the bank of rivers. But due to modern civilization and further growth in human population, the quality and quantity of river has been reduced. Water pollution is a world-wide problem and became a global problem. It is leading global deaths of living beings and spreading of harmful deadly diseases throughout the world. Due to water pollution it is accounted for the deaths of more than about 14,000 people daily. For about 700 million people don't have access to a paper toilet and good hygiene in their daily life. The drainage systems are the major source of the water pollution especially from the rivers which is flowing through the city. These drainage systems generally carry industrial wastes and domestic wastes as well as sewage and medicinal wastes making the river water horrendously polluted to the core. The greater part of the significant towns are situated close to the stream banks gathering each waste sources in it. The river Gomti flows through Lucknow,India and is the main source of water for every purpose for the city. Gomti stream is begun from Madhoganj Tanda town in Pilibhit district,UP. It streams throughthe locale of Shahjahanpur,Hardoi,Sitapur,Kheri,Barabanki,Lucknow,Sultanpur,Jaunpur and at last gets together with Ganga. Gomti river receives huge amount of industrial effluents to domestic discharge as well as sewage and agricultural run-off which again brings lot of pesticides,fertilizer. Then street washouts brings oil,asphalts,sediments and many types of heavy metals. These activities made the river a flowing dumping yard. The present study shows the water quality of river Gomti at Lucknow. Three sample sites were selected infront of the Riverfront of Lucknow. Parameters like pH. Dissolved oxygen, Total hardness, Total alkalinity, Chloride were determined. The sources of pollution in the river deteriorated the quality of water considerably in the selected stretch of Gomti river.

**Key Words** : D.O., alkalinity, PAH, pH and heavy metals.

## INTRODUCTION

Water is a very important natural resource having social and economic value for the human beings. Genrally water encompasses 71% of the Earth's surface, for the most part in oceans and seas, little bits of water happen as groundwater (1.7%), in the ice sheets and the ice tops of Antarctica and Greenland (1.7%) and noticeable all around as vapor, mists (framed of ice and fluid water suspended in air) and precipitation (0.001%)(1). Fluid water covers the waterways, for example, a sea, ocean, lake, stream, stream, channel, lake and so on. Water assets in India present as precipitation, surface and ground

water stockpiling and hydropower potential. India as of now stores just 6% of its yearly precipitation or 253 billion cubic meters (8.9 × 〖10〗^12 cu pt), while created nations deliberately store 250% of the yearly precipitation in parched stream bowls(2).

The surface water such as rivers are the major concern of water pollution due to carrying municipal, industrial and agricultural wastages. The waterway water contamination are genrally happened from point sources and non point sources(3). The point sources are fundamentally the primary release of residential sewage through open channels as well as from sewerage framework, modern waste and so on. The non point wellsprings of contamination are the release of horticulture kept running off, washing off fabrics, cows floundering and tossing of bodies or half consumed dead bodies and so forth.

Water quality testing is a significant piece of ecological observing. At the point when water quality is exceptionally poor, it encompasses biological system of a water body. Water quality parameters can be partitioned as physical, substance or organic elements. Physical properties of water quality parameter are temperature and turbidity(4). Compound qualities incorporate parameters, for example, pH and disintegrated oxygen. Natural pointers or components of water quality parameter incorporate green growth and phytoplankton. Water quality parameter checking can be an assistance to foresee and gain from characteristic procedures in nature and decide human effects on a biological system(5). These estimation endeavors can likewise be the help of reclamation extends or guarantee that the ecological guidelines are being met.

In this project, the water of Gomti River, Lucknow is being tested to check the quality of its water. The Gomti River starts from Gomal Taal which was officially known as Fulhaar Jheel close Madho Tanda, Pilibhit, India(6). It reaches out to 900 km all through the Uttar Pradesh and meets the Ganga River close Saidpur Kaithi in Gazipur. Its water covers around 22,735 square km. Subsequent to going around 240 km Gomti enters in Lucknow, where it goes for around 16 km. The stream fills in as the significant wellspring of the residential supply of water in Lucknow(7)The stream gets back the untreated household wastewater from Lucknow, Jagdishpur, Sultanpur, Jaunpur towns and effluents from a couple of ventures (refineries, sugar plants, substance and others.) straightforwardly during its move through these spots(8).

The region of the Gomti River of where it flows infront of the Riverfront, Lucnow, is chosen to collect the water samples. 3 water samples are collected and tested to analyze the pollution level in the river. Water quality parameters which are chosen to test the pollution level are – pH, Alkalinity, Water Hardness, Dissolved Oxygen, Chloride estimation.

**Water Quality Parameters**

**pH :-**

pH is called logarithm of hydrogen ions. So total hydrogen ions present in a water sample determines pH level of that water sample. pH ranges start from 0 (which is extremely acidic) to 14 (which is extremely basic). pH 7 is the neutral value (neither acidic nor basic).

**Total Alkalinity :-** Total Alkalinity is the measurement of the acid needed to bring the water sample to the pH level of 4.2. In this particular pH level, all the alkaline compounds present in the water sample are used up.

**Total Hardness :-** Total hardness is the total measurement of the minerals which are present in the water sample which can be irreparable by boiling process. Total Calcium and total Magnesium hardness are the equivalent to the total hardness. It can be determined by the multivalent cations total concentration present in the water(9).

**Dissolved Oxygen :-** Dissolved oxygen is the total amount of oxygen dissolved in the water body. It is an important indicator to show the quality of the water body and its aquatic ecosystem.

**Chloride estimation :-** Chloride as chloride (Cl-) particle is one of the most significant inorganic anions in water and wastewater. The chloride particle fixation is higher in wastewater than in typical water since sodium chloride is a typical compound for eating routine. Along the ocean seaside zone chloride might be available in high fixation in view of spillage of salt water into the adjacent sewage framework. The deliberate chloride particles is commonly used to know saltiness of various water sources. For salty water, it is a significant parameter. It additionally hampers COD substance and accordingly it requires a revision to be made based on sum present or else a complexing specialist, for example, HgSO4 can be included. Aside from that chloride particles are utilized as tracer particles in section ponders looking for changed contaminants in soil and fluid media(10).

## Materials & Methodology :-

>>**Sample Collection**: The water sampling was done in June 2019 in between 9.00 a.m to 2.00 p.m. from both sides of river Gomti, Lucknow. Five physico-chemical parameters namely pH, Total Hardness, D.O., Alkalinity and Chloride were analysed.

a) **pH** - There are two strategies associated with the assurance of pH estimation of water. They are:

1. Colorimetric Method 2. Electrometric Method

**Colorimetric Method for pH of Water :**

The pH standard arrangement is taken and the water tests that will be tried. The colorimetric paper is taken. This paper is plunged on the water tests. The got shading is processed from the standard table and the separate pH worth is recorded. This pH Value will finish up whether the example of water is acidic or soluble.

Sample 1 :

| SERIAL NO. | pH VALUES | AVERAGE |
|---|---|---|
| 1. | 7.6 | |
| 2. | 7.5 | 7.6 |
| 3. | 7.7 | |

Sample 2 :

| SERIAL NO. | pH VALUES | AVERAGE |
|---|---|---|
| 1. | 7.8 | |
| 2. | 7.9 | 7.8 |
| 3. | 7.6 | |

Sample 3 :

| SERIAL NO. | pH VALUES | AVERAGE |
|---|---|---|
| 1. | 7.6 | |
| 2. | 7.8 | 7.7 |
| 3. | 7.8 | |

b) **Dissolved Oxygen (DO)** – The DO of the test water was determined by Modified Winkler Azide method (APHA, 1985).

Reagents Preparation

i. **Sodium thiosulphate (0.025N)** : 0.1N stock solutions was prepared by dissolving 24.82g of $Na_2S_2O_3.H_2O$ in boiled-cooled DDW and adding 0.4g of pellet of NaOH as stabilizer and made volume to 1 liter. The stock solution (0.1N) then was diluted 4 times with DDW to prepare 0.025N solutions.

ii. **Alkaline Iodide Azide Solution** : 700g of KOH and 150g of KI is dissolved in DDW to volume made to 1 liter. 10g of $NaN_3$ is dissolved in 40ml of DDW. $NaN_3$ solution is added, with constant stirring, to the cooled alkaline iodide solution.

iii. **Manganese sulphate solution** : 100g of $MnSO_4.4H_2O$ was dissolved in 200ml of DDW.

iv. **Starch indicator** : 1% solution was prepared in boiling water and used after cooling at room temperature.

v. **Concentrated $H_2SO_4$ (specific gravity 1.84)**

Procedure

300ml of water sample was collected in BOD bottle during experiment and 2ml of manganese sulphate and 2ml of alkaline azide solution were added in that. Brown precipitate(ppt) appeared. The brown ppt was dissolved by adding 2ml of concentrate $H_2SO_4$ and 200ml of the same solution was titrated against 0.025N $Na_2S_2O_3$ using starch an indicator. At the end point, initial dark blue color turns to colorless. The DO present in the water sample was determined using following formula :

$$\text{DO (mg/l)} = \frac{\text{N of } Na_2S_2O_3 \times \text{Volume of } Na_2S_2O_3 \times 8 \times 100}{V_2(V_1 - V) \times V_1}$$

Where,

V= Volume of $MnSO_4$ and KI added,

$V_1$= Total volume of water sample taken,

$V_2$= Volume of the part of the content titrated

Sample 1 :

| SERIAL NO. | INITIAL READING | FINAL READING | DIFFERENCE | AVERAGE |
|---|---|---|---|---|
| 1. | 0 | 6.60 | 6.60 | |
| 2. | 0 | 6.58 | 6.58 | 6.59 |
| 3. | 0 | 6.59 | 6.59 | |

Sample 2 :

| SERIAL NO. | INITIAL READING | FINAL READING | DIFFERENCE | AVERAGE |
|---|---|---|---|---|
| 1. | 0 | 6.54 | 6.54 | |
| 2. | 0 | 6.59 | 6.59 | 6.57 |
| 3. | 0 | 6.58 | 6.58 | |

Sample 3 :

| SERIAL NO. | INITIAL READING | FINAL READING | DIFFERENCE | AVERAGE |
|---|---|---|---|---|
| 1. | 0 | 6.59 | 6.59 | |
| 2. | 0 | 6.56 | 6.56 | 6.58 |
| 3. | 0 | 6.60 | 6.60 | |

c) **Total Hardness** – Total hardness was determined by the method of Snoeyink et al. (1980).

Reagents

i. **Buffer solution** :

- 16.9g of $NH_4Cl$ was dissolved in 143ml of concentrated $NH_4OH$ (Solution 1).
- Dissolved 1.179g of disodium EDTA and 0.78g of $MgSO_4.H_2O$ in 50ml in DDW (Solution 2). Mixed solution 1 and 2 and the volume maintained to 250ml with DDW.

i. **EDTA solution (0.01M)** : 3.72g of disodium EDTA was dissolved in DDW to prepare 1 liter of solution.

ii. **Eriochrome black-T indicator :** Mixed 0.4g of Eriochrome black-T indicator with 100g NaCl and grinded.

iii. **Sodium sulphide solution :** 3.7g of $Na_2S.5H_2O$ dissolved in 100ml DDW.

Procedure

50ml of water sample was taken in conical flask. To this, 1ml of buffer solution and 2-3 drop of $Na_2S$ solution were added. About 100-200mg of Eriochrome black-T indicator was added to the same when solution becomes wine red. The mixture was titrated against standard EDTA solution. The end point was recorded when, color changes from wine red to blue. The calcium and magnesium hardness was calculated using the following formula.

Total hardness (mg/l) = $\frac{\text{ml of EDTA taken} \times 100}{\text{Sample volume (ml)}}$

Sample 1 :

| SERIAL NO. | INITIAL READING | FINAL READING | DIFFERENCE | AVERAGE |
|---|---|---|---|---|
| 1. | 0 | 11.1 | 11.1 | |
| 2. | 0 | 10.6 | 10.6 | 10.7 |
| 3. | 0 | 10.6 | 10.6 | |

Sample 2 :

| SERIAL NO. | INITIAL READING | FINAL READING | DIFFERENCE | AVERAGE |
|---|---|---|---|---|
| 1. | 0 | 9.3 | 9.3 | |
| 2. | 0 | 9.3 | 9.3 | 9.4 |
| 3. | 0 | 9.6 | 9.6 | |

Sample 3 :

| SERIAL NO. | INITIAL READING | FINAL READING | DIFFERENCE | AVERAGE |
|---|---|---|---|---|
| 1. | 0 | 8.5 | 8.5 | |
| 2. | 0 | 8.7 | 8.7 | 8.6 |
| 3. | 0 | 8.6 | 8.6 | |

**d) Total Alkalinity –** Total alkalinity was determined by the method of Snocyinkad et al. (1980).

Reagents

i. **Sulphuric acid $H_2SO_4$ (specific gravity 1.84)**

ii. **Sodium hydroxide (NaOH)**

iii. **Sodium carbonate (0.05N) :** 5.30g of $Na_2CO_3$ was dissolved in 100ml volumetric flask.

iv. **Methyl orange indicator :**
0.5g of methyl orange was dissolved in 100ml of water and diluted to 1000ml with DDW.

v. **Phenolphthalein indicator (pH 8.3)**

Procedure

100ml sample was taken in a 250ml conical flask and was added with 2 to 3 drops of phenolphthalein indicator. If pink color developed it was titrated with 0.02N $H_2SO_4$ till it disappears. Next, added 2 to 3 drops of methyl orange to the same flask and continued to titrate till pH got down to 4.5 orange color changes to pink.

The following formula was used for calculation in case of $H_2SO_4$ is not 0.02N :

Alkalinity (mg/l as $C_aCO_3$) = $\frac{A \times N \times 50 \times 100}{\text{Sample volume (ml)}}$

Where, N = Normality of $H_2SO_4$ used.

Phenolphthalein alkalinity (mg/l as $C_aCO_3$) = $\frac{\text{End point (A)} \times 1000}{\text{Sample volume (ml)}}$

Methyl orange alkalinity (mg/l as $C_aCO_3$) = $\frac{\text{End point (B)} \times 1000}{\text{Sample volume (ml)}}$

Total alkalinity (mg/l as $C_aCO_3$) = $\frac{(A + B) \times 1000}{\text{Sample volume (ml)}}$

NO RESULTS FOUND

**e) Chloride Estimation –** Chloride estimation is determined by the method of Mohr's method.

Reagents

i. **Chloride free distilled water**

ii. **Standard silver nitrate solution (0.0141N) :** 2.395g $A_gNO_3$ is dissolved in distilled water and diluted to 1 litre. Standardise against 0.0141N NaCl. Stored in a brown bottle.

iii. **Potassium chromate indicator :** 50g potassium chromate ($K_2Cr_2O_4$) is dissolved in little distilled water. Silver nitrate solution is added until a definite red precipitate is formed. Let it stand for 12 hours, filtered and diluted the filtrate to 1 litre with distilled water.

iv. **Standard sodium chloride 0.014N :** 824.1mg NaCl (dried at140˚C) is dissolved in chloride free water and diluted to 1 litre.

v. **Aluminium hydroxide suspension :** 125g aluminium potassium sulphate is dissolved in 1 litre water. It is warmed to 60˚C and added 55ml concentrated $NH_4OH$ slowly with stirring. Let it stand for 1 hour, transferred the mixture to a large bottle. When it is freshly prepared the suspension occupies a volume of approximately 1 litre.

**Procedure**

1) 50ml of sample is taken and diluted to 100ml.
2) If the sample is coloured, 3ml of aluminium hydroxide is added, shaken well; allowed to settle, filtered, washed and collected filtrate.
3) Sample is brought to pH 7-8 by adding acid or alkali as required.
4) 1 ml indicator (Potassium chromate) is added.
5) The solution is titrated against standard silver nitrate solution until a reddish brown precipitate is obtained. The volume (V) is noted down.
6) The procedure is repeated for blank. The volume ($V_2$) is noted down.

Sample 1

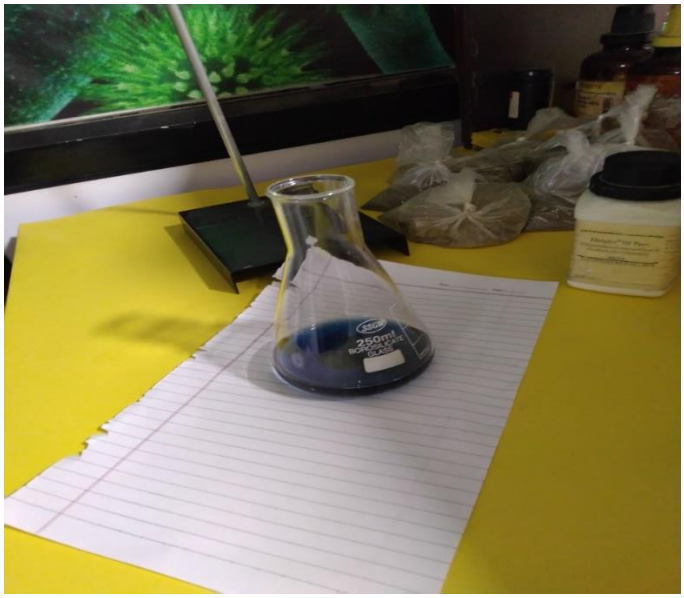
| SERIAL NO. | WEIGHT OF UNKNOWN (g) | VOLUME OF $AgNO_3$ (ml) | % (w/w) of Cl |
|---|---|---|---|
| 1 | 0.20 | 26.90 | 47.6 |
| 2 | 0.25 | 33.70 | 47.4 |
| 3 | 0.18 | 24.30 | 47.4 |

Sample 2

| SERIAL NO. | WEIGHT OF UNKNOWN (g) | VOLUME OF $AgNO_3$ (ml) | % (w/w) of Cl |
|---|---|---|---|
| 1 | 0.23 | 28.70 | 42.7 |
| 2 | 0.27 | 35.06 | 42.9 |
| 3 | 0.21 | 26.35 | 42.5 |

Sample 3

| SERIAL NO. | WEIGHT OF UNKNOWN (g) | VOLUME OF $AgNO_3$ | % (w/w) of Cl |
|---|---|---|---|
| 1 | 0.19 | 25.70 | 43.6 |
| 2 | 0.21 | 27.20 | 43.4 |
| 3 | 0.24 | 30.35 | 43.8 |



**Results and Discussion** :-

**Colour** :- All the examples were daintily hued and demonstrated more defilement.

**Odour:-** All the examples were softly hued and observed to smell foul.

**pH:-** Sample 1 was having the base pH of 7.6 though test 2 was having the greatest pH of 7.8.

**Alkalinity:-** According to WHO measures HDL and MPL of for all out alkalinity is 200-600 ppm. All examples demonstrated no outcome.

**Total Hardness:-** According to WHO models, HDL and MPL of all out hardness is 300-600 ppm. Test 1 is the hardest of all.

**Chloride content:-** According to WHO principles, HDL and MPL ofhchloride is 250-1000 ppm. Test 1 was having more worth.

**Dissolved Oxygen:-** According tohWHO gauges, HDL and MPL of disintegrated oxygen is 2-6 ppm. All examples show variety from this worth which might be the reason for contamination at the example

locales. The examination demonstrates that the data fundamental for checking drinking water quality investigation. It centers around testing results got from drinking water supplies of various zones of city. Countless variables and topographical conditions impact the connections between's various sets of physico-substance parameters of water tests(11)

| PARAMETERS | AVERAGE | STANDARD DEVIATION |
|---|---|---|
| pH | 7.7 | 0.1 |
| DISSOLVED OXYGEN | 6.58 | 0.01 |
| TOTAL HARDNESS | 9.56 | 1.05 |
| ALKALINITY | ---- | ---- |
| CHLORIDE | 44.58 | 2.52 |

| SAMPLES | pH | DISSOLVED OXYGEN (ppm) | TOTAL HARDNESS (ppm) | ALKALINITY (ppm) | CHLORIDE (ppm) |
|---|---|---|---|---|---|
| 1 | 7.6 | 1.2 | 836.85 | ---- | 905.25 |
| 2 | 7.8 | 3.7 | 800 | ---- | 860 |
| 3 | 7.7 | 3.6 | 736.4 | ---- | 845.7 |

## Conclusion

From our present examination we can presume that the water of Gomti River is most likely not fit for drinking and it requires a ton of treatment to decrease the defilements uncommonly the alkalinity and hardness. To limit the sullying of the water of Gomti at Lucknow city, the qualities which is acquired had their criticalness esteem which help in choosing the best possible techniques for treatment of the water since drinking water fluctuates here and there relying upon the state of the source from which it is streams and the treatment done. The present investigation might probably be the evidence to be valuable to get unadulterated water.

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